

**PISCATAQUA RIVER BASIN
DEERFIELD , NEW HAMPSHIRE**

FREESES POND DAM

NH - 00472

NHWRB-61.02

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

The original hardcopy version of this report
contains color photographs and/or drawings.
For additional information on this report
please email

U.S. Army Corps of Engineers
New England District
Email: Library@nae02.usace.army.mil



**DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154**

MAY 1979

UNCLASSIFIED

CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 1 00472	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Reeses Pond Dam		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
6. NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL		7. PERFORMING ORG. REPORT NUMBER
8. AUTHOR(s) ARMY CORPS OF ENGINEERS ENGLAND DIVISION		9. CONTRACT OR GRANT NUMBER(s)
10. PERFORMING ORGANIZATION NAME AND ADDRESS		11. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
12. CONTROLLING OFFICE NAME AND ADDRESS T. OF THE ARMY, CORPS OF ENGINEERS ENGLAND DIVISION, NEDED TRAPELO ROAD, WALTHAM, MA. 02254		13. REPORT DATE May 1979
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. NUMBER OF PAGES 56
		16. SECURITY CLASS. (of this report) UNCLASSIFIED
		17a. DECLASSIFICATION/DOWNGRADING SCHEDULE
18. DISTRIBUTION STATEMENT (of this Report) ROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED		
19. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
20. SUPPLEMENTARY NOTES er program reads: Phase I Inspection Report, National Dam Inspection Program; ever, the official title of the program is: National Program for Inspection of -Federal Dams; use cover date for date of report.		
21. KEY WORDS (Continue on reverse side if necessary and identify by block number) MS, INSPECTION, DAM SAFETY, ascataqua River Basin eerfield, New Hampshire amprey River		
22. ABSTRACT (Continue on reverse side if necessary and identify by block number) he dam is a stone wall embankment da with an uncontrolled concrete gravity s pillway. The dam is about 140 ft. long with a height of 7 ½ ft. The dam is essed to be in poor condition. The dam is classified as being small with a ignificant hazard potential. The test flood for the dam is ½ the PMF. There e various remedial measures which must be implemented by the owner.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

OCT 2 1979

Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Gallen:

I am forwarding to you a copy of the Freezes Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Water Resources Board, the cooperating agency for the State of New Hampshire. In addition, a copy of the report has also been furnished the owner, Retex, Inc., P.O. Box 991, Portsmouth, New Hampshire 03801.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Water Resources Board for your cooperation in carrying out this program.

Sincerely yours,

Max B. Scheider
MAX B. SCHEIDER

Colonel, Corps of Engineers
Division Engineer

Incl
As stated

PISCATAQUA RIVER BASIN
DEERFIELD, NEW HAMPSHIRE

FREESES POND DAM

NH-00472

NHWRB-61.02

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

NH-00472

NHWRB-61.02

FREESSES POND DAM

DEERFIELD
ROCKINGHAM COUNTY, NEW HAMPSHIRE

LAMPREY RIVER

November 17, 1978

BRIEF ASSESSMENT

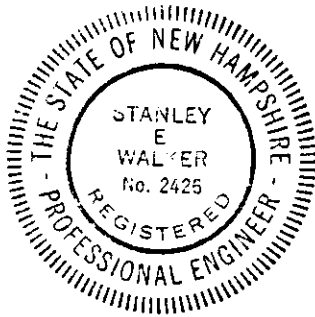
The Freeses Pond Dam is a stone wall embankment dam with an uncontrolled concrete gravity spillway. The dam is about 140 feet long and 7-1/2 feet high.

Based on the visual inspection, the dam is assessed to be in poor condition. Major concerns relative to the long-term safety of the dam include the lack of spillway capacity, loss of capstones in the embankment sections, loss of embankment material, erosion of the training wall and embankment east of the controlled outlet, and the collapse of the stone masonry training wall west of the spillway. Based on Corps of Engineer's guidelines, the dam is classified as a small dam having a significant hazard potential.


Based on size and hazard classification the test flood outflow for evaluating spillway capacity is one-half the Probable Maximum Flood. The routed 1/2 PMF discharge at the dam is estimated to be 6,000 cfs. The spillway is capable of passing only one percent of the test flood without overtopping the westerly stone wall embankment section of the dam. The test flood would overtop this section of the dam by about 5.9 feet. It is estimated that the dam would be completely submerged at discharges greater than 1,100 cfs and that high tailwater conditions would exist below the dam at flows greater than about 400 cfs.

The recommendations and remedial measures outlined in Section 7 should be implemented within 12 months of receipt of this report by the owner. The need for increased spillway capacity and curtailment of seepage and leakage through embankment sections of the dam should be evaluated by a qualified engineer and mitigating measures implemented as necessary. A program of regular inspection and maintenance should be adopted and a formal warning system should be developed for use in event of an emergency. Remedial measures include repair of the concrete training wall east of the controlled outlet, repair or replacement of the stone masonry training wall west of the spillway, replacement of dislodged

capstones on the westerly embankment, establishment of erosion protection of the earth embankment sections of the dam, repair or replacement of the stop logs, and removal of debris from the downstream channel. A program of annual inspection by a qualified engineer should be instituted.



EDWARD C. JORDAN CO., INC.


Stanley E. Walker, P.E.
Project Officer

This Phase I Inspection Report on Freezes Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph W. Finegan, Jr.

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Recommended Guidelines for Safety Inspection of Dams, the spillway test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

TABLE OF CONTENTS

	<u>PAGE</u>
LETTER OF TRANSMITTAL	
BRIEF ASSESSMENT.....	i
REVIEW BOARD SIGNATURE SHEET.....	iii
PREFACE.....	iv
TABLE OF CONTENTS.....	v
OVERVIEW PHOTOGRAPH.....	vii
LOCATION MAP.....	viii

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL.....	1-1
1.2 DESCRIPTION OF PROJECT.....	1-1
1.3 PERTINENT DATA.....	1-3

SECTION 2 - ENGINEERING DATA

2.1 DESIGN.....	2-1
2.2 CONSTRUCTION.....	2-1
2.3 OPERATION.....	2-1
2.4 EVALUATION.....	2-1

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS.....	3-1
3.2 EVALUATION.....	3-3

SECTION 4 - OPERATING PROCEDURES

4.1 PROCEDURES.....	4-1
4.2 MAINTENANCE OF DAM.....	4-1
4.3 MAINTENANCE OF OPERATING FACILITIES.....	4-1
4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT.....	4-1
4.5 EVALUATION.....	4-1

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES.....	5-1
---------------------------------	-----

TABLE OF CONTENTS (Continued)

SECTION 6 - STRUCTURAL STABILITY

6.1	EVALUATION OF STRUCTURAL STABILITY.....	6-1
-----	---	-----

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1	DAM ASSESSMENT.....	7-1
7.2	RECOMMENDATIONS.....	7-1
7.3	REMEDIAL MEASURES.....	7-2
7.4	ALTERNATIVES.....	7-2

APPENDICES

A	FIELD INSPECTION NOTES	
B	ENGINEERING DATA	
C	PHOTOGRAPHS	
D	HYDROLOGIC AND HYDRAULIC COMPUTATIONS	
E	INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS	



OVERVIEW

PHASE I INSPECTION REPORT

FREESES POND DAM

SECTION 1

PROJECT INFORMATION

1.1 GENERAL

a. Authority. Public Law 92367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Edward C. Jordan Co., Inc. has been retained by the New England Division to inspect and report on selected dams in the states of Maine and New Hampshire. Authorization and notice to proceed were issued to Edward C. Jordan Co., Inc. under a letter of December 1, 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW3379C0017 has been assigned by the Corps of Engineers for this work.

b. Purpose.

- (1) To perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) To encourage and prepare the states to initiate effective dam safety programs for non-Federal dams.
- (3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF PROJECT

a. Location. The Freeses Pond Dam is located on the Lamprey River in the town of Deerfield, New Hampshire. N 43°-9.1', W 71°-14.0'.

b. Description of Dam and Appurtenances. The Freeses Pond Dam is a stone wall embankment dam with an uncontrolled concrete overflow spillway, and an earth embankment easterly dike. The upstream face of the easterly dike

is protected by a concrete wingwall. The dam is about 7-1/2 feet high and 140 feet long. It is founded partly on bedrock and partly on soil.

A controlled outlet structure is located at the east end of the spillway. This outlet is regulated by stop logs, which must be removed manually.

c. Size Classification. Using the Corps of Engineers "Recommended Guidelines for Safety Inspection of Dams," Freeses Pond Dam is classified as a small dam based on both storage capacity (270 acre-feet) and height (7-1/2 feet). According to the Guidelines, a small dam is one with storage capacity less than 1,000 acre-feet and height less than 40 feet.

d. Hazard Classification. The Freeses Pond Dam is classified as having a significant hazard potential. The peak flow from hypothetical failure of the dam was estimated to be 1,000 cfs based on the guideline procedures provided by the Corps of Engineers. Failure of the dam would result in river stages of about 5 to 6 feet at the village of Deerfield Parade located approximately 3,000 feet below the dam. A few habitable structures (2 to 5) could be inundated to depths of 1 to 2 feet. It should be noted that high tailwater conditions at the dam would occur at flows greater than about 400 cfs.

e. Ownership.

Current Owner: Retex, Inc.
P.O. Box 991
Portsmouth, New Hampshire 03801

Previous Owners: The following names of previous owners were obtained from a review of correspondence and inspection reports on file at the New Hampshire Water Resources Board. Although dates of prior ownership are not known, the names are listed in chronological order of ownership from most recent ownership to early ownership.

Maro F. Hammond
North Edgecomb, Maine

Arthur J. Hammond
Rockport, Massachusetts

Jenny Freese
(address unknown)

Dudley Freese
Gossville, New Hampshire

f. Operator.

Retex, Inc.

Contact: John Trafton
P.O. Box 536
Exeter, N.H. 03833
Tel: 603-431-6221

g. Purpose of Dam. This dam is currently used to maintain the level of Freeses Pond for recreational purposes.

h. Design and Construction History. No data relative to original design and construction of the dam were available. It appears from records on file with the New Hampshire Water Resources Board that a dam has existed at this site since prior to 1917. The records indicate that repairs were made in 1938. These repairs included the construction of the concrete wingwall on the upstream face of the easterly embankment, repair of stop log slots, and pointing up of the masonry in the west side of the spillway.

Additional renovations of the dam were made about 1954. A new concrete spillway and stop log outlet structure were constructed at that time. A drawing of the proposed construction work is on file at the N.H. Water Resources Board and is referenced in Appendix B of this report.

i. Normal Operating Procedure. There are no formal operating procedures for this dam. The water level in Freeses Pond is regulated by a stop log controlled outlet at the east end of the spillway.

1.3 PERTINENT DATA

a. Drainage Area. The drainage area above the Freeses Pond Dam is about 8.2 square miles. The watershed is primarily forested with very little area developed. The terrain is rolling. Freeses Pond is the only significant water body in the drainage basin.

b. Discharge at Damsite. Regulated discharge from Freeses Pond Dam can be made at the controlled outlet. However, at the time of inspection, leakage through the stop logs and other sections of the dam precluded overflow through either the spillway or the controlled outlet. The following discharges were estimated assuming water surface at top of dam (elev. 429.2 MSL) unless otherwise noted.

- (1) Spillway capacity - 70 cfs.
- (2) Maximum flood at damsite is unknown.
- (3) Controlled outlet capacity (stop logs removed) - 93 cfs.
- (4) Controlled outlet capacity (top of stop logs at elev. 428 feet) - 10 cfs.
- (5) Total project discharge at test flood (1/2 PMF) - 6,000 cfs.

c. Elevation.

ITEM	APPROXIMATE ELEVATION (MSL)
Streambed at centerline of dam	421.8 ft
Maximum tailwater	Unknown
Normal water surface (spillway crest)	428.0 ft
Full flood control pool	Not Applicable
Spillway crest	428.0 ft
Invert of controlled outlet	424.0 ft
Design surcharge (original design)	Unknown
Top of dam (stone wall embankment section)	429.2 ft
Elevation of test flood (1/2 PMF)	435.1 ft

d. Reservoir Length.

ITEM	LENGTH (FEET)
Normal water surface pool (elev. 428.0 ft)	4,000
Top of dam (elev. 429.2 ft)	4,300

e. Storage.

ITEM	STORAGE (ACRE-FEET)
Normal water surface pool (elev. 428.0)	217
Spillway crest (elev. 428.0)	217
Top of dam (elev. 429.2)	270
1/2 PMF pool (elev. 435.1)	820

f. Reservoir Surface.

ITEM	SURFACE AREA (ACRES)
Normal water surface (elev. 428.0)	70
Spillway crest (elev. 428.0)	70
Top of dam (elev. 429.2)	82
1/2 PMF pool (elev. 435.1)	156

g. Dam.

Type - The dam consists of a stone wall embankment section, an uncontrolled concrete overflow spillway, and an earth embankment section with a concrete wingwall on its upstream face.

Length - Approximately 140 feet.

Height - Approximately 7-1/2 feet (top of stone wall embankment section to centerline of downstream bed).

Top Width - See plan and cross-section sketches in Appendix B-1.

Side Slopes - Vertical side slopes on double stone wall portion of dam; see plan and cross-section sketches in Appendix B-1.

Zoning - Not known.

Impervious Core - Not known.

Cutoff - Cutoff for spillway section is formed by concrete poured to bedrock. Cutoff for embankment sections is not known.

Grout Curtain - Not known.

h. Diversion and Regulating Tunnel. Not applicable.

i. Spillway.

Type - Uncontrolled, free overfall spillway constructed of concrete with vertical upstream face and near-vertical downstream face.

Length - About 17.5 feet.

Crest Elevation - Approximately 428.0 feet (MSL).

Gates - No control gates are provided on the spillway crest.

Upstream Channel - Freeses Pond comprises the approach channel to the spillway. This channel is generally clear and unobstructed. However, the area immediately upstream of the spillway is heavily laden with sediment and debris. This does not appear to inhibit flow to the spillway. About 2,500 feet upstream from the dam, a causeway crosses the pond and causes a constriction in the reservoir.

Downstream Channel - The channel of the Lamprey River below the Freeses Pond Dam has an average slope of about 0.5%. The streambed is composed primarily of gravels and cobbles. The overbank areas generally contain a moderate growth of brush and trees. There are a number of trees and much debris in the channel immediately below the dam. No scour was evident at the downstream toe of the dam. The channel is constricted by a highway bridge located about 170 feet downstream of the dam.

j. Regulating Outlets.

Invert - Approximately 242.0 feet (MSL).

Size - 5.8 feet high by 3 feet wide.

Description - The outlet is located at the east end of the spillway. It is formed by concrete training walls,

furnished with manually removable concrete stop logs. At the time of inspection, the stop logs appeared in poor condition and a significant amount of debris had accumulated at the upstream side of the outlet, thus inhibiting its operation.

Control Mechanism - There is no mechanical or electrical control mechanism for this outlet.

SECTION 2

ENGINEERING DATA

2.1 DESIGN

No design data are available relative to original construction of the Freezes Pond Dam. No design data are available for repairs apparently made in or about 1938. One drawing is on file with the New Hampshire Water Resources Board which pertains to reconstruction of the dam in or about 1954. This drawing is referenced in Appendix B.

2.2 CONSTRUCTION

No engineering data are available regarding construction or reconstruction of this dam.

2.3 OPERATION

No engineering data relative to operation of the dam are available.

2.4 EVALUATION

- a. Availability. One drawing of proposed 1954 reconstruction of the dam is available. Otherwise, no engineering data are available for the Freezes Pond Dam.
- b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the assessment of this dam has been based on the visual inspection, past performance history, and engineering judgment.
- c. Validity. Not applicable.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

- a. General. The Freeses Pond Dam is a stone wall embankment dam with an uncontrolled concrete overflow spillway. The dam has a height of about 7-1/2 feet. The westerly embankment appears to have been overtopped frequently. See Appendix A for detailed inspection notes, Appendix B for plan, profile and cross-section sketches of the structure, and Appendix C for photographs taken during the visual inspection.
- b. Dam.
- (1) Structural - The westerly embankment portion of the dam consists of dry-laid stone masonry walls with a central soil fill. The spillway section is concrete placed on bedrock. The easterly portion is earth and stone embankment with a concrete wingwall on the upstream face. See the Overview Photograph and Photograph 1. The inspection resulted in the following major findings:
- (a) The stone wall embankment section of the dam west of the spillway appears reasonably true to line and grade. Some local depressions exist in the embankment apparently due to a loss of embankment materials through the masonry. Several of the capstones from the downstream wall have been dislodged. Substantial seepage is occurring through this section. Seepage of about 5 gpm was occurring in several areas and in one area, a concentrated flow of about 30 gpm was occurring.
- (b) The junction between the westerly stone wall section and the concrete spillway is in poor condition. The masonry wall which formed the end of the westerly embankment section abutting the spillway has collapsed. It appears that the dam has been partially breached in this area. (See Overview and Photograph #1). A partial repair has been made using gravel, stones and blocks of concrete. The area had

been sandbagged when the review inspection was made on December 1, 1978.

- (c) The spillway section of the dam appears to be in good structural condition (see Photograph #2). Minor leakage is occurring at the joint between the concrete and bedrock but appears insignificant.
 - (d) The junction between the stop log outlet and the easterly embankment is in poor condition. The concrete training wall is spalled and eroded and erosion of the embankment has occurred (see Photograph #2).
 - (e) The easterly embankment section appears to be in fair condition. Substantial seepage is occurring into the upstream face of this section and out of the downstream face near the stop log outlet. Substantial erosion has occurred on the downstream face of this section. The concrete wingwall which forms the upstream face has cracked and appears to have undergone some settlement (see Photograph #3).
- (2) Hydraulics - Hydraulic control of the water surface is provided by the controlled outlet and the free overfall spillway. At the time of the visual inspection the pond level was about 0.1 foot below the crest of the spillway. The spillway capacity is limited by the lack of freeboard between spillway crest and top of west embankment. With water at spillway crest, only about 1.0 foot of freeboard is available at the dam. There is not an adequate sidewall provided at the west end of the spillway. The stop log controlled outlet was clogged with debris; however, the owner's representative cleaned the outlet while the inspection team was on-site. The reservoir can be drawn down at this controlled outlet. The natural channel below the dam provides energy dissipation of spillway discharges.

c. Appurtenant Structures. The stop log outlet is in poor condition. The easterly training wall is badly deteriorated. The stop logs are fabricated of concrete and were found to be deteriorated. It appears that removal of the lower stop logs would be very difficult due to a build-up of sediment and debris at the upstream face of the outlet.

- d. Reservoir Area. The reservoir shoreline is primarily forested. At the headwaters of the reservoir, there are many cabins and year-round dwellings. New Hampshire Route 107 traverses the reservoir approximately 2,500 feet above the dam. The road causes a constriction of the reservoir at its crossing. Slopes above the reservoir are moderate. No evidence of slope failure above the reservoir was observed during the field inspection.
- e. Downstream Channel. The channel of the Lamprey River below the Freezes Pond Dam has an average slope of about 0.5%. The streambed is composed of gravel and cobbles. The overbank areas contain a moderate growth of brush and timber. The channel immediately below the dam contains a number of trees and much debris. The channel is constricted by a highway bridge located about 170 feet downstream of the dam.

3.2 EVALUATION

Based on the visual inspection findings the dam appears to be in poor condition. The junctions between the concrete spillway and embankment sections are in poor condition and considerable leakage and seepage is occurring. The westerly embankment section is apparently overtopped frequently and several of the capstones have been dislodged. As outlined in Section 7, rehabilitative construction is necessary to re-establish integrity of the structure.

SECTION 4

OPERATING PROCEDURES

4.1 PROCEDURES

There are no formal operating procedures for the Freeses Pond Dam. The dam is owned by an investment group, members of which occasionally check the structure and perform maintenance on an as-needed basis. The level of Freeses Pond can be regulated at the dam by adjustment of the stop logs in the controlled outlet.

4.2 MAINTENANCE OF DAM

Maintenance of the dam is on an as-needed basis. The dam has apparently received little attention in recent years, although brush and trees were recently cut from the westerly embankment section of the dam.

4.3 MAINTENANCE OF OPERATING FACILITIES

The stop log controlled outlet needs maintenance. The stop logs, which are fabricated of concrete, are badly deteriorated. Serious spalling and erosion of the easterly concrete training wall have occurred. A considerable amount of sediment and debris have accumulated at the upstream side of the outlet and inhibit its operation.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no formal warning system known to be in effect for this dam.

4.5 EVALUATION

The Freeses Pond Dam lacks a routine operation and maintenance program. No records of operation or maintenance activities are kept. No formal warning system is in effect. As outlined in Section 7 of this report, rehabilitative maintenance is necessary to facilitate operation of this dam.

SECTION 5
HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

- a. General. The Freezes Pond Dam consists of a stone wall embankment section, a concrete spillway, a stop log controlled outlet structure, and an earth embankment section with a concrete wingwall on its upstream face. The spillway is an uncontrolled, free-overfall structure with a vertical upstream face and slightly inclined downstream face. Freezes Pond is the only significant water body in the 8.2 square mile drainage area. The reservoir is currently used for recreation purposes. Many year round dwellings are located on the reservoir.
- b. Design Data. No original hydrologic or hydraulic design data were available.
- c. Experience Data. No information regarding specific overtopping events or other notable hydrologic occurrences was available. However, during the visual inspection of the dam, it was noted that a breach of the stone wall embankment had previously occurred at the junction of the embankment and the concrete spillway. The depth of overtopping that caused this breach was not disclosed.
- d. Visual Observations. Water level at the Freezes Pond Dam is regulated by the stop log controlled outlet and the free overfall spillway. During the inspection, the following observations of the hydraulic characteristics of the dam were made:
 - (1) The controlled outlet structure was clogged by debris. The stop logs are made of concrete and were found to be in poor condition. The stop logs would be difficult to remove during high flows.
 - (2) Only about 1 foot of freeboard exists between the spillway crest and the stone wall embankment. In addition, no protective training wall was provided between the concrete spillway and the stone wall embankment section.

- (3) Normal water surface elevation appeared to be at or very close to spillway crest.
- (4) Leakage through and beneath the dam was about equal to low flow discharge.

e. Test Flood Analysis. The Freeses Pond Dam is classified as having a significant hazard potential. Using Corps of Engineers "Recommended Guidelines for Safety Inspection of Dams," the spillway test flood is one-half the Probable Maximum Flood (1/2 PMF). The drainage area above the dam is 8.2 square miles and is characterized as rolling. The 1/2 PMF has a peak inflow of about 7,000 cfs. The routed peak outflow of the 1/2 PMF is estimated to be 6,000 cfs. The spillway is capable of discharging approximately 70 cfs or about 1% of the test flood without overtopping of the stone wall embankment section. With stop logs in place, the 1/2 PMF event would overtop the dam by about 5.9 feet. As shown in Appendix D, the removal of the stop logs has little effect on the rating curve or the routing effect of the dam. Considering the bridge 170 feet downstream of the dam, it was estimated that the dam would become completely submerged at discharges greater than about 1,100 cfs. High tailwater conditions appear to exist below the dam at flows greater than about 400 cfs.

f. Dam Failure Analysis. To determine the hazard classification for the Freeses Pond Dam, the potential impact of failure of the dam at maximum pool (elev. 492.2 ft MSL) was assessed. The failure analysis relied upon the Corps of Engineers' "rule-of-thumb" guidelines. The hazard potential was determined by calculating downstream dam failure hydrographs which might result from a breach of the stone wall embankment section of the dam.

The flood peak at the dam from failure was computed to be approximately 1,000 cfs. It would take the reservoir about 6.5 hours to empty. At a distance of approximately 900 feet below the dam, the peak flow would be reduced to about 950 cfs with a corresponding river stage of between 3 and 4 feet. At the village of Deerfield Parade located about 3,000 feet downstream of the dam, the peak flow was estimated to be 880 cfs corresponding to a river stage of approximately 5 feet.

Thus, a failure of the Freeses Pond Dam might cause damage to a few (2 to 5) habitable structures located in

and near the village of Deerfield Parade, New Hampshire. Flood depths of 1 to 2 feet would occur at these structures. However, it should be noted that high tailwater conditions could substantially limit the size of a breach in the dam and consequently reduce the actual failure discharge.

The stone wall embankment section of the dam is considered to be only moderately resistant to erosion caused by overtopping.

SECTION 6

STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observations. Based on the visual observations, the Freeses Pond Dam appears to be in poor condition. It appears that the westerly stone wall embankment section of the dam is overtopped quite frequently and has undergone distress related to overtopping. Several capstones have been dislodged and the training wall adjacent to the westerly end of the spillway has collapsed. It appears that the dam has been partially breached in recent years at the junction between the spillway and the westerly embankment. A considerable amount of embankment and foundation seepage is occurring in this section.

The junction between the stop log outlet and the easterly embankment is in poor condition (see Photograph #2). In this area the concrete training wall is badly deteriorated and embankment materials have eroded. Seepage is occurring through the dam at this junction.

The easterly embankment section has an upstream concrete wingwall which is cracked in two areas. Leakage through the dam is occurring along the wall (see Photograph #3). It also appears that the wall has undergone some settlement.

- b. Design and Construction Data. No data concerning original design or construction of the Freeses Pond Dam were available for this investigation.
- c. Operating Records. None available.
- d. Post-Construction Changes. Records of the New Hampshire Water Resources Board indicate that repairs were made to the dam in 1938. These included the construction of a concrete wingwall east of the outlet structure, work on the stop log slots, and pointing up of the masonry in the westerly portion of the dam. In 1954 another major repair was made to the structure. At that time, a concrete spillway was installed to replace the old stone wall spillway and the stop log outlet was rebuilt. Since 1954 no major construction changes have been made. Considerable tree and brush growth occurred on the

westerly embankment section in recent years. This growth had been recently cut.

- e. Seismic Stability. The dam is located in Seismic Zone No. 2 and in accordance with recommended Phase I guidelines, does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

- a. Condition. Based on the visual inspection and performance history, the Freeses Pond Dam is assessed to be in poor condition. Major concerns relative to the dam's condition are identified as follows:
- (1) The lack of adequate spillway capacity and freeboard to prevent overtopping of the embankment sections.
 - (2) The loss of capstones and embankment soil from the westerly embankment section and the collapse of the stone masonry training wall west of the spillway.
 - (3) Erosion of the easterly embankment at the training wall next to the controlled outlet, deterioration of the concrete training wall and apparent settlement of the upstream concrete wingwall.
 - (4) Seepage and leakage through both embankment sections.
- b. Adequacy of Information. The information available is such that the assessment of the condition of the dam has been based on the visual inspection, the past performance of the dam, and engineering judgment.
- c. Urgency. The recommendations and remedial measures outlined below should be implemented within 12 months of receipt of this report by the owner.
- d. Need for Additional Investigation. Additional investigation is not considered necessary for the current assessment.

7.2 RECOMMENDATIONS

The following should be evaluated by a qualified engineer and mitigating measures implemented as necessary:

- (1) The need for increased spillway capacity and freeboard.
- (2) Curtailment of seepage and leakage through the embankment sections of the dam.

7.3 REMEDIAL MEASURES

a. Operating and Maintenance Procedures. A program of regular inspection and maintenance of the dam should be implemented and a record of these activities should be kept. The following specific maintenance and operating procedures should be implemented:

- (1) Repair the concrete training wall east of the outlet structure.
- (2) Repair or replace the stone masonry training wall west of the spillway.
- (3) Replace missing capstones and re-establish erosion protection for the embankment sections of the dam.
- (4) Repair or replace stop logs and put the controlled outlet into an operable condition.
- (5) Provide for 24 hour surveillance of the structure during anticipated high flow conditions.
- (6) Develop a formal warning system and implement its use in the event of an emergency.
- (7) Have the dam inspected by qualified engineers once every year.
- (8) Remove debris from the downstream channel.

7.4 ALTERNATIVES

An alternative to implementing the recommendations and remedial measures outlined above would be the removal of the dam. Such removal should be performed under the supervision of a qualified engineer, with consideration given to potential release of accumulated sediments or other possible environmental impacts of lowering the level of Freeses Pond.

Permanent lowering of the pond by removal of stop logs is not considered a viable alternative in that there is no security to prevent unwarranted persons re-closing the stop log outlet.

APPENDIX A
VISUAL INSPECTION CHECKLIST
AND
SUPPLEMENTARY INSPECTION NOTES

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Freesees Pond Dam

DATE 11/17/78

TIME A.M.

WEATHER Sunny, cool

W.S. ELEV. 427.9 U.S. 422+ DN.S.

PARTY:

- | | |
|--------------------------|-------------|
| 1. <u>Stephen Cole</u> | 6. <u></u> |
| 2. <u>John Devine</u> | 7. <u></u> |
| 3. <u>David Nyman</u> | 8. <u></u> |
| 4. <u>Timothy Noonan</u> | 9. <u></u> |
| 5. <u>Daniel Lane</u> | 10. <u></u> |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Geotechnical</u>	<u>Cole</u>	
2. <u>Structural</u>	<u>Cole, Nyman, Devine</u>	
3. <u>Civil</u>	<u>Nyman</u>	
4. <u>Hydraulics/Hydrology</u>	<u>Devine</u>	
5. <u>Photography</u>	<u>Devine, Nyman</u>	
6. <u>Survey</u>	<u>Noonan, Lane</u>	
7. <u></u>		

<u>Review 12/1/78</u>	<u>S. Walker, C. Horstmann</u>
<u>On 12/1/78, sand bags had been placed at crest in area of previous</u>	
<u>breach at west end of spillway. Stop log bay closed.</u>	

NOTE: See Supplementary Inspection Notes Following Checklist

INSPECTION CHECKLIST

PROJECT Freezes Pond Dam DATE 11/17/78
 PROJECT FEATURE Embankment NAME Cole
 DISCIPLINE Geotechnical NAME _____

AREA EVALUATED	CONDITIONS
----------------	------------

DAM EMBANKMENT

Crest Elevation	429.2 ft (MSL) approximate
Current Pool Elevation	427.9 ft (MSL) approximate
Maximum Impoundment to Date	West dike overtopped
Surface Cracks	None
Pavement Condition	Turf, some areas, none
Movement or Settlement of Crest	Some small depressions west section
Lateral Movement	None
Vertical Alignment	Fair
Horizontal Alignment	Okay
Condition at Abutment and at Concrete Structures	Poor, erosion at both ends of spillway section
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	None
Sloughing or Erosion of Slopes or Abutments	Downstream face of east embankment eroded
Vegetation	

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u> (cont.)	
Rock Slope Protection - Riprap Failures	No riprap
Unusual Embankment or Downstream Seepage	Several small springs downstream of east embankment. Seepage at toe of west embankment.
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

INSPECTION CHECKLIST

PROJECT Freezes Pond Dam DATE 11/17/78
 PROJECT FEATURE Intake Channel, Structural NAME Cole, Devine, Nyman
 DISCIPLINE Structural, Geotechnical, H/H NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	Outlet works consist of stop log outlet.
a. Approach Channel	
Slope Conditions	Flat, wooded
Bottom Conditions	Gravel
Rock Slides or Falls	None
Log Boom	None
Debris	Reservoir generally clear, but much sediment and debris immediately adjacent to outlet.
Condition of Concrete Lining	N/A
Drains or Weep Holes	N/A
b. Intake Structure	
Condition of Concrete	Good
Stop Logs and Slots	Concrete stop logs badly deteriorated, slots fair.

INSPECTION CHECKLIST

PROJECT Freezes Pond Dam

DATE 11/17/78

PROJECT FEATURE Control Tower

NAME Cole, Devine

DISCIPLINE Structural

NAME Nyman

AREA EVALUATED

CONDITION

OUTLET WORKS - CONTROL TOWER

a. Concrete and Structural

NOT APPLICABLE

General Condition

Condition of Joints

Spalling

Visible Reinforcing

Rusting or Staining of Concrete

Any Seepage or Efflorescence

Joint Alignment

Unusual Seepage or Leaks in Gate Chamber

Cracks

Rusting or Corrosion of Steel

b. Mechanical and Electrical

NOT APPLICABLE

Air Vents

Float Wells

Gate Hoist

Elevator

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - CONTROL TOWER (cont.)</u>	
Hydraulic System	NOT APPLICABLE
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

INSPECTION CHECKLIST

PROJECT Freezes Pond Dam DATE 11/17/78
 PROJECT FEATURE Transition, Conduit NAME Cole, Devine
 DISCIPLINE Structural, Geotechnical NAME Nyman
Hydrology/Hydraulics

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u>	
General Condition of Concrete	Eroded, spalled
Rust or Staining on Concrete	None
Spalling	Severe spalling, east side
Erosion or Cavitation	Erosion east side
Cracking	Cracks east side
Alignment of Monoliths	N/A
Alignment of Joints	Okay
Numbering of Monoliths	N/A

PERIODIC INSPECTION CHECKLIST

PROJECT Freesees Pond Dam DATE 11/17/78

PROJECT FEATURE Outlet Structure, Channel NAME Cole, Devine

DISCIPLINE Structural, Geotechnical NAME Nyman
Hydrology/Hydraulics

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL

General Condition of Concrete	Fair
Rust or Staining	None
Spalling	Severe, east training wall
Erosion or Cavitation	East training wall
Visible Reinforcing	None
Any Seepage or Efflorescence	Seepage at toe of east training wall
Condition at Joints	Joints appear okay
Drain holes	None
Channel	
Loose Rock or Trees Overhanging Channel	Trees and debris in channel
Condition of Discharge Channel	Fair - no erosion, trees and debris, bridge downstream

INSPECTION CHECKLIST

PROJECT Freezes Pond Dam DATE 11/17/78
 PROJECT FEATURE Spillway NAME Cole, Devine
 DISCIPLINE Structural, Hydrology/Hydraulics NAME Nyman

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS

a. Approach Channel

General Condition	Good, clear, unobstructed
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Gravel, some silt

b. Weir and Training Walls

General Condition of Concrete	Good
Rust or Staining	None
Spalling	None
Any Visible Reinforcing	None
Any Seepage or Efflorescence	Minor seepage at joint to bedrock
Drain Holes	None

c. Discharge Channel

General Condition	Fair
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Trees and debris in channel
Floor of Channel	Bedrock, cobbles, boulders, no erosion
Other Obstructions	Bridge downstream

INSPECTION CHECKLIST

PROJECT Freezes Pond Dam DATE 11/17/78
 PROJECT FEATURE Service Bridge NAME Cole
 DISCIPLINE Structural NAME _____

AREA EVALUATED	CONDITION
----------------	-----------

<u>OUTLET WORKS - SERVICE BRIDGE</u>	None
--------------------------------------	------

a. Superstructure

Bearings

Anchor Bolts

NOT APPLICABLE

Bridge Seat

Longitudinal Members

Under Side of Deck

Secondary Bracing

Deck

Drainage System

Railings

Expansion Joints

Paint

b. Abutment & Piers

General Condition of Concrete

Alignment of Abutment

Approach to Bridge

Condition of Seat & Backwall

SUPPLEMENTARY INSPECTION NOTES
FREESES POND DAM
DEERFIELD, NEW HAMPSHIRE

The Freezes Pond Dam is about 140 feet in length and about 7 feet in height. It consists of a stone wall embankment section, a central concrete gravity spillway, and an earth embankment section.

I. CONCRETE AND STONE MASONRY STRUCTURES IN GENERAL

- a. Concrete Surfaces. The surface of the concrete spillway portion of the dam was found to be in good condition with little or no spalling or erosion evident. The concrete in the easterly training wall is severely spalled and eroded.

Stone Masonry Surfaces - The stone masonry portions of the dam consist of upstream and downstream faces of the earth embankment which makes up the westerly portion of the dam. These stone masonry walls are dry-laid. They appear to be in generally good condition and are reasonably true to line and grade.

- b. Structural Cracking. No structural cracking was observed in the spillway section of the dam. The easterly training wall is cracked and shows signs of settlement. The concrete wingwall on the upstream face of the easterly embankment section of the dam is also cracked at two locations and appears to have settled somewhat on the westerly end.

- c. Movement, Horizontal and Vertical Alignment. In general, the dam appears to be reasonably true to line and grade. The easterly wingwall shows evidence of settlement next to the controlled outlet.

- d. Junctions. The junction between the stop log outlet at the easterly end of the spillway and the easterly dike was found to be in very poor condition. Substantial erosion and loss of concrete has occurred in this area and substantial leakage is occurring. The junction between the concrete spillway and the stone wall embankment to the west is also in very poor condition. It appears that the dam has been breached in this area in the past and has been repaired by adding a sandy gravel fill, stones, boulders and chunks of concrete. Substantial leakage is occurring at this junction.

- e. Drains, Foundation Joint and Face. No formal drainage system was observed in the dam.
- f. Water Passages. The surface of the spillway was found to be in very good condition with no evidence of erosion or spalling. The concrete training wall at the easterly edge of the stop log controlled outlet is seriously spalled and eroded.
- g. Seepage and Leakage. Minor leakage was observed to be occurring at the toe of the spillway section at its junction to the bedrock. A substantial amount of seepage was occurring just east of the stop log outlet section, through and beneath the training wall.
- h. Monolith Joints and Construction Joints. The joints in the concrete sections of the dam show little evidence of weathering or distress. No serious movement has occurred at the joints.
- i. Foundation. The spillway section of the dam appears to be founded directly on bedrock. The joint between the concrete and the bedrock was found to be in generally good condition. Some minor foundation seepage was observed. The easterly wingwall of the structure appears to be founded on soil and apparently has settled somewhat from loss of soil.
- j. Abutment. The easterly abutment between the embankment section and the stop log outlet shows signs of distress and serious erosion has occurred. The westerly abutment between the concrete and stone wall section of the dam has apparently been breached in the past and repaired with gravel, stones, boulders and chunks of concrete. Substantial seepage is presently occurring through this area and a high water level would likely cause substantial erosion.

2. EMBANKMENT STRUCTURES

The westerly section of the dam consists of stone masonry walls with earth embankment fill. The easterly portion of the dam consists of an earth embankment with a concrete wingwall on the upstream face and stone masonry downstream face.

- a. Settlement. Some localized settlement was observed along the top of the embankment sections apparently due

to the loss of material down through the stone masonry retaining walls. No evidence of general settlement of the embankments was observed.

b. Slope Stability. The westerly embankment section has dry-laid stone masonry walls both on the upstream and downstream sides. These walls were found to be in generally good condition and show no signs of serious instability. The easterly embankment section has a concrete wingwall on the upstream face which was found to be in generally good condition. This embankment apparently had a masonry downstream face which has since collapsed. The condition downstream presently is a raw slope consisting of sand, gravel and boulders. Substantial erosion has occurred at the toe of this slope.

c. Seepage. A substantial amount of seepage was occurring at the downstream toe of the stone masonry wall of the westerly embankment section. The seepage appeared to be general; however, concentrated seepage was occurring at one point and was estimated to be about 30 gpm. Two other seeps were estimated to be discharging at least 5 gpm each. Some sandy material was observed downstream of the seepage areas, apparently material lost from the embankment section. There is no tree growth presently on the slopes of the dam. Some small stumps exist.

Seepage was observed to be occurring into the upstream face of the easterly embankment section. This seepage appears to outlet near the stop log outlet.

3. SPILLWAY SECTIONS

The spillway consists of an uncontrolled, straight drop, overflow weir.

a. Control Gate and Operating Machinery. The spillway is a vertical overflow section with no control gates.

b. Unlined Saddle Spillways. None.

c. Approach and Outlet Channels. The approach channel to the spillway was found to be heavily laden with sediment immediately adjacent to the structure, although the reservoir is generally clear and unobstructed. However, there was no debris present in the channel that would affect operation of the spillway. About 2,400 feet upstream is a causeway which traverses Freeses Pond,

with an arch culvert providing for cross flow between the sections of the pond (see Photo 7). The downstream channel has brush and trees within the channel and a substantial amount of debris among the trees. A bridge is located about 170 feet downstream of the dam.

- d. Stilling Basin. The stilling basin consists of a boulder and cobble strewn bedrock channel. No erosion or scour was noted.

4. OUTLET WORKS

The outlet works consist of a stop log outlet located at the east end of the spillway.

- a. Intake Structure. The intake structure to the stop log outlet consists of the concrete sidewalls. An accumulation of sand, gravel and other debris was noted to exist immediately upstream of the stop logs. The lower three or four stop logs could not be removed due to this accumulation of the debris.
- b. Operating and Emergency Control Gates. The stop logs have to be manually removed from the outlet works. The stop logs are made of concrete and are deteriorated. Based on visual observation, the stop logs would be extremely difficult to remove.
- c. Conduits, Sluices and Water Passages. The easterly side or training wall adjacent to the stop log section is seriously spalled and eroded.
- d. Stilling Basin. The stilling basin below the controlled outlet consists of a boulder and cobble strewn bedrock channel. No serious scour or erosion was noted.
- e. Approach and Outlet Channel. The approach channel to the outlet consists of the pond, which appears to be clear and unobstructed. As noted above, a substantial amount of sediment and debris adjacent to the outlet inhibits its operation. The outlet channel has many trees in the channel as well as other debris.
- f. Drawdown Facilities. The controlled outlet structure can be used to drawdown the water level of the reservoir. During the field inspection, it was observed that due to the accumulation of debris at the upstream face of the dam, the controlled outlet was not capable of regulating outflow.

5. SAFETY AND PERFORMANCE INSTRUMENTATION

None.

6. RESERVOIR

- a. Shoreline. The potential for slope failure along the reservoir shoreline appeared minimal. New Hampshire Route 107 traverses the reservoir about 2,400 feet above the dam causing a constriction of the reservoir water surface at that point. Many year-round residences are located at the upper end of the reservoir.
- b. Sedimentation. The extent of sedimentation in the reservoir in general is not known and could not be observed during the visual inspection. The sediment accumulation does not impede flow to the spillway. However, an accumulation of sediment and debris does exist adjacent to and upstream of the spillway and does inhibit operation of the stop log outlet.
- c. Potential Upstream Hazard. The residences located directly on the banks at the upstream end of the reservoir above the Route 107 crossing of the reservoir could be inundated to depths of 1 to 2 feet during the 1/2 PMF event. The flooding would be caused by the backwater effects of the road crossing.
- d. Watershed Runoff Potential. No significant changes in watershed runoff potential are expected to occur in the near future.

7. DOWNSTREAM CHANNEL

The channel of the Lamprey River below the Freeses Pond Dam has an average slope of about 5.3 feet per thousand. The streambed is composed primarily of gravels and cobbles. The overbank areas generally contain a moderate growth of brush and trees. The channel is slightly constricted by a highway bridge located about 170 feet downstream of the dam. The channel immediately below the dam contains trees and debris.

8. OPERATING AND MAINTENANCE FEATURES

- a. Reservoir Regulation Plan. No formal plan was disclosed.
- b. Maintenance. It appears that the dam is maintained on an as-needed basis. The existing spalling of the con-

crete and erosion west of the spillway indicates that a regular maintenance program is not in effect.

APPENDIX B

ENGINEERING DATA

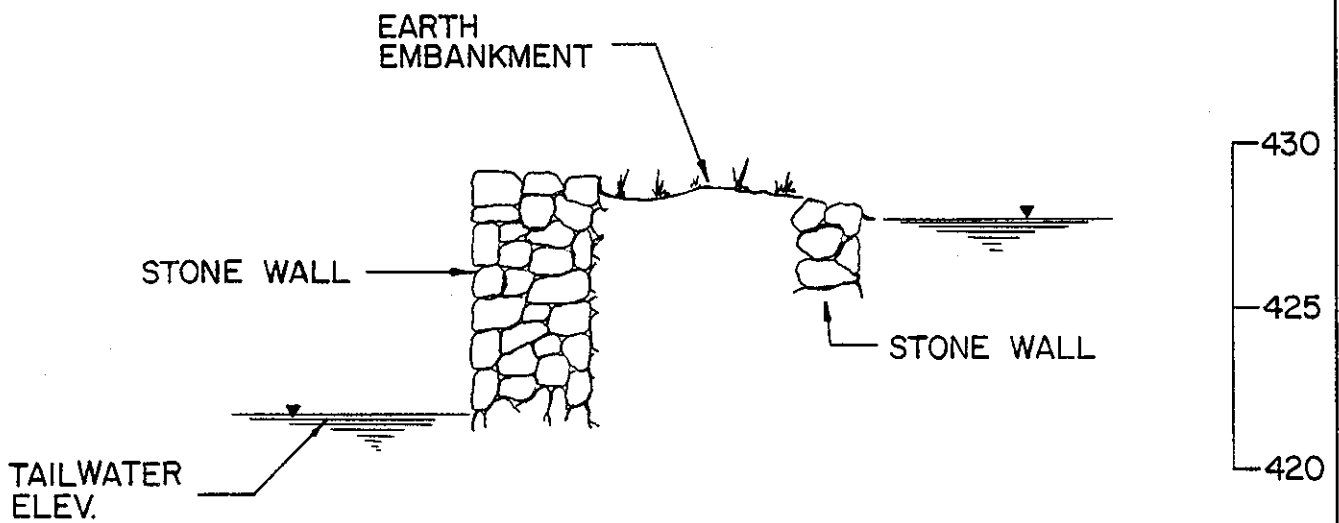
This appendix lists the engineering data collected from project records and other sources of data developed as a result of the visual inspection. The contents of this appendix are listed below.

<u>Appendix</u>	<u>Description</u>
B-1	General Project Data
B-2	Past Inspection Reports

APPENDIX B-1

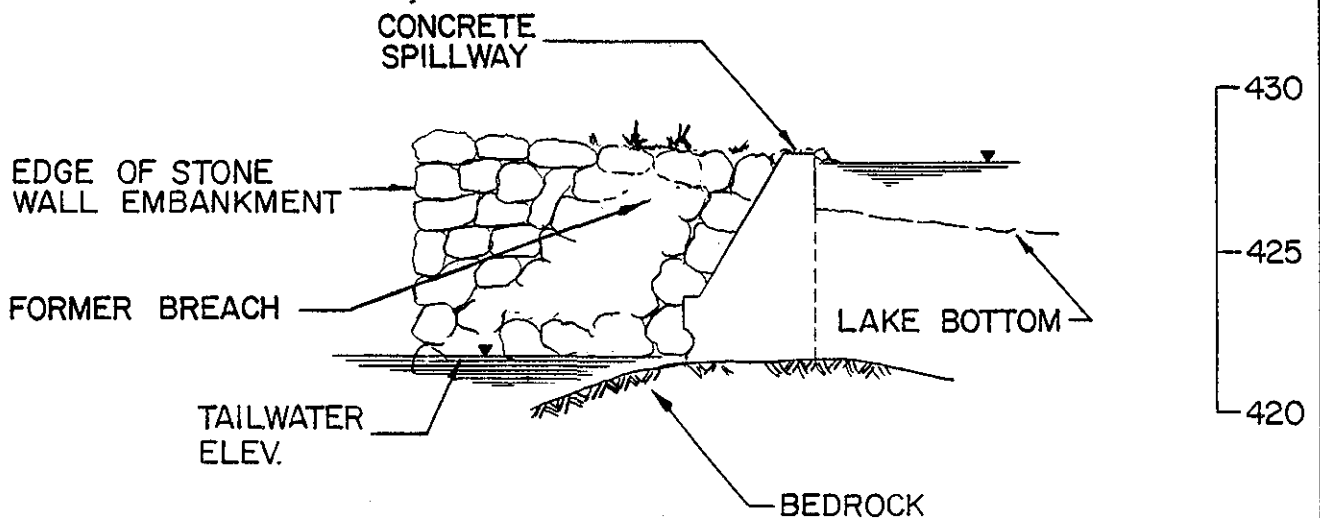
GENERAL PROJECT DATA

- I. The following information is available at the New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire.
 - A. Drawing entitled "Proposed Sluiceway and Spillway, Freese Pond, Deerfield, N.H.," by Maro F. Hammond, dated August 23, 1954.
 - B. Periodic inspection reports, copies of which are attached as Appendix B-2 of this report.
 - C. Photographs taken of the dam at various times from 1934 to present.
 - D. Miscellaneous correspondence and inventory data pertaining to the dam.
- II. The following plan, profile and cross-section sketches were developed from a limited stadia survey conducted during the visual inspection, field notes taken by inspection team members and photographs taken during the inspection. The survey was referenced to an arbitrary local datum and subsequently converted to MSL reference by interpolation from U.S.G.S. quadrangle.



SECTION A

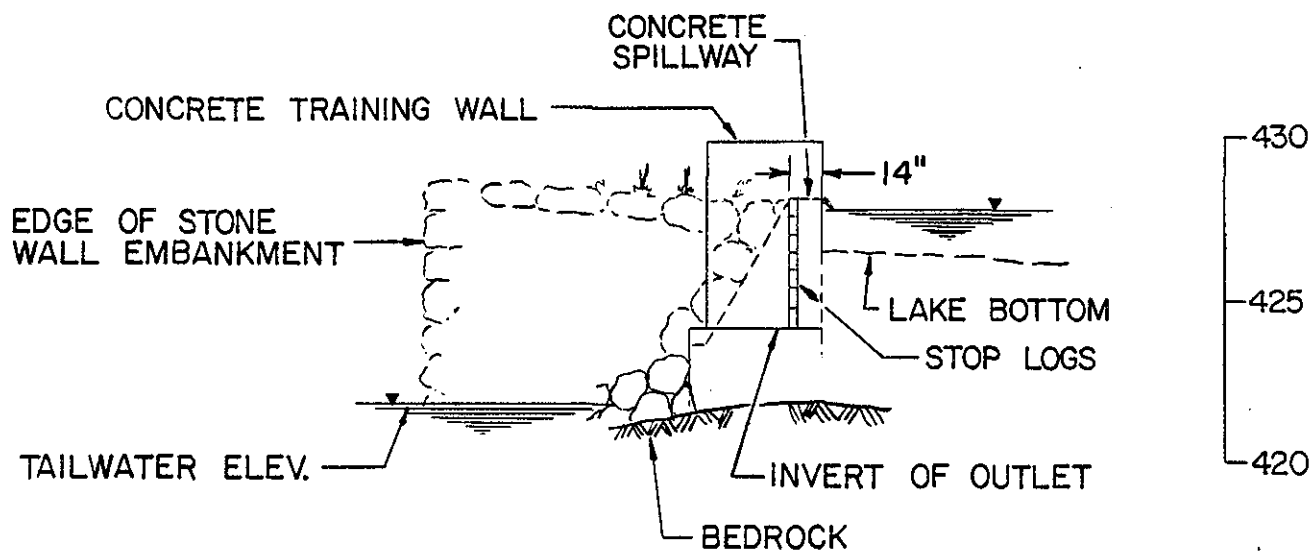
APPROXIMATE U.S.S.
ELEVATION



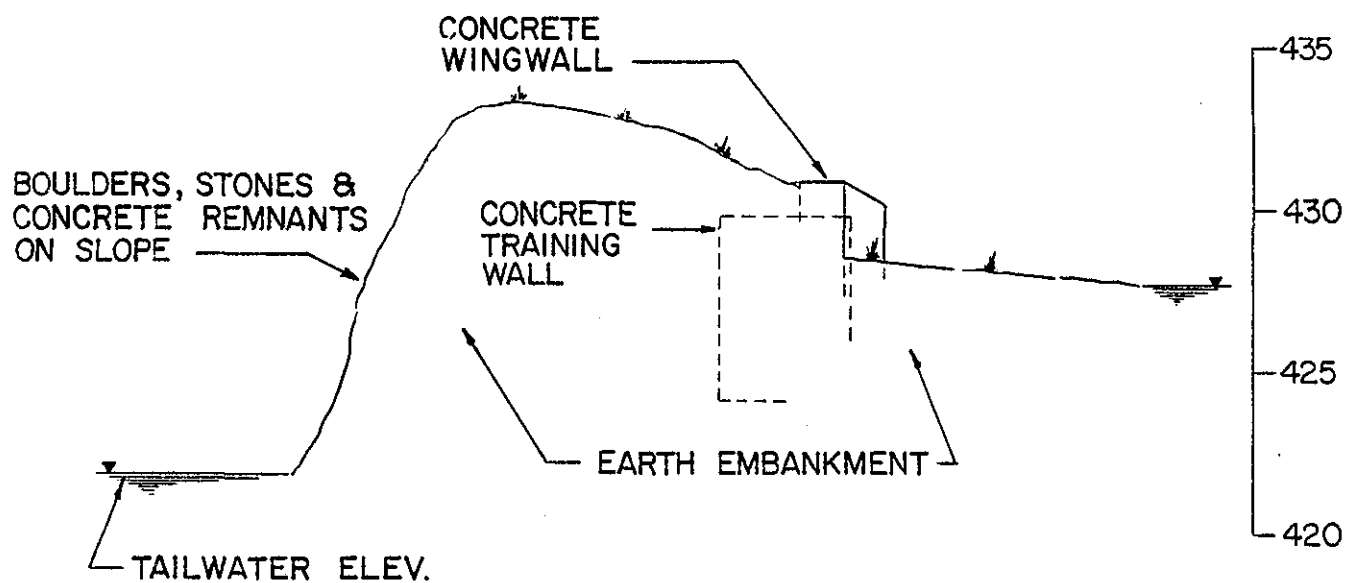
SECTION B

3 0 6 FEET

EDWARD C. JORDAN CO., INC. PORTLAND, MAINE		U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS MILITARY WASH.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
FREESES POND DAM			
CROSS SECTION			
20799-09		SCALE AS SHOWN DATE JAN 1979	



SECTION C



SECTION D

3 0 6 FEET

EDWARD C. JORDAN CO., INC. PORTLAND, MAINE		U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS MELTHER, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
FREESES POND DAM			
CROSS SECTION			
20799-03		SCALE	AS SHOWN
		DATE	JAN 1975

APPENDIX B-2

PAST INSPECTION REPORTS

Attached are copies of inspection reports pertaining to the Freeses Pond Dam on file with the New Hampshire Water Resources Board in Concord, N.H.

B-2.1

Freeses Pond Dam

DRAINAGE AREA

8.23 a.m.

1936 FLOOD $\frac{c}{a}/\frac{q}{m}.$ AT PITTSFIELD

77.4/a.m.

Spill cfs 132.
gate 30.162. cfs M

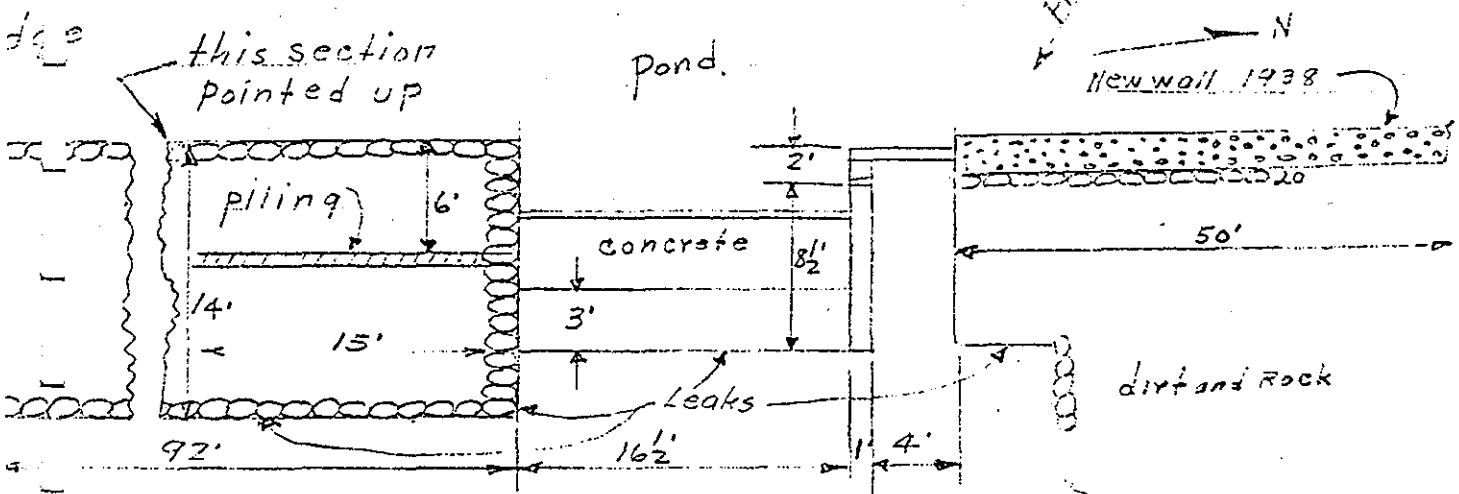
say 20. cfs. a.m.

This dam was repaired sometime last fall. The work comprised a concrete wall from the gate structure eastward for about twenty feet on the pond side of embankment. The wall was then back filled. In addition the key way for stop log ends were repaired, and the top of the rocks on west side of spillway were pointed up with cement. Evidently the water spills over this section for about 30 feet in extreme high water. I could not see any leaks but one could not tell until frost comes out of ground.

Spill section could be sandbagged but only flow out would be the gate.

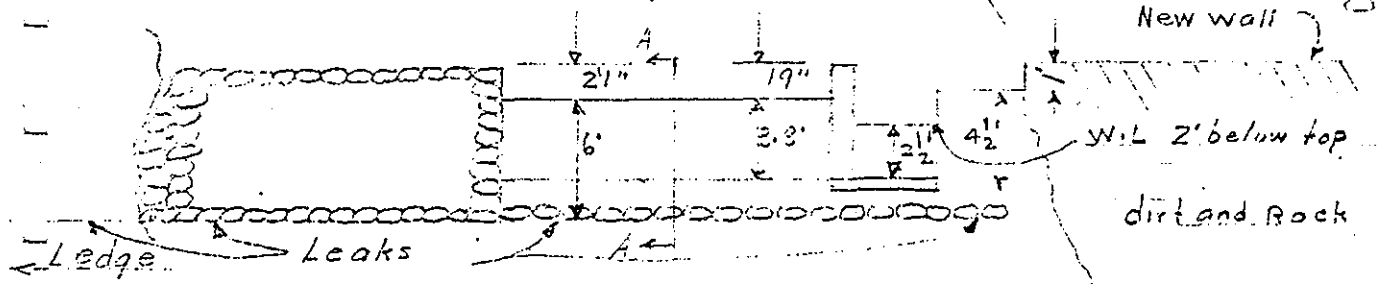
I don't believe anyone can tell if rock walls leak until frost goes out.

COPY

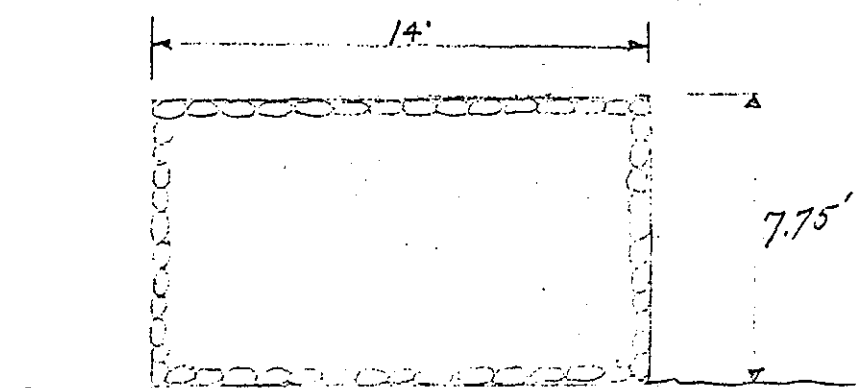


PLAN scale 1"=10'-0"

W.L. 21" below spillway crest



ELEVATION



SECTION A-A scale 1"=1'-0"

B-2.3

Freezes Pond Dam

COPY

MEMORANDUM

TO: Mr. Frost

RE: Inspection of Freezes Pond Dam on July 1, 1964

Dam built essentially as per plan dated 8/23/1954.

Noted gate is really reinforced concrete slabs as stop logs. Top concrete plank was badly deteriorated but presents no menace.

Dam leaks some at stop log section and right abutment end of spillway.

Some of masonry wall (old) needs pointing up near bottom (right of spillway). This is not serious at present.

Debris and earth filled in against stop logs to within 12" to 18" of spillway crest. Water down 6"- from spillway crest and about 4" down from top of concrete stop logs.

Dam is in good condition generally. Only a minimum leakage which is really only scant fish water.

F. C. M.
Francis C. Moore
Civil Engineer

COPY

NEW HAMPSHIRE WATER RESOURCES BOARD

INSPECTION REPORT

Location: DEERFIELD Dam Number: 61.02

Name of Dam, Stream and/or Water Body: FREES POND DAM

Owner: MARO F. HAMMOND Telephone Number: _____

Mailing Address: N. EDGECOMB

Maximum Height of Dam: 7' ± Pond Area: SEE USGS MAP Length of Dam: 125' ±

Construction: EARTH ~~LEAVE~~ LT SIDE
LEDGE RT SIDE

Upstream Works: 20' CONCRETE SPILLWAY
3' INOPERABLE STOP LOG SECTION

COPY

Abutments: LT ABUT CONCRETE EXTREMELY DETERIORATED
RT ABUT LEDGE
AT JUNCTION OF NEW CONC & OLD STONE SPILLWAY
STONES ARE DISPLACED

Bankment: LT. RECENT FILL PLACED SAND & GRAVEL NO VEG.
LT. FILL WASHED OUT FROM BEHIND ABUT. ^{VISIBLE HOLE} IN TOP
SEVERAL AREAS MISSING FILL ON OLD STONE DAM
MANY TREES GROWING ON OLD STONE DAM

SPILLWAY:

Length: 20'

Freeboard: 6" TO TOP OF OLD DAM
2' AT LT CONC ABUT
10 OR MORE FT @ RT LEDGE

SEE AGE:

Location, estimated quantity, etc.

LT ABUT 75 GPM ±

OLD STONE DAM 30 GPM @ 1 LOCATION

MINOR SEEPAGE @ 2 OTHER LOCATIONS

Changes Since Construction or Last Inspection:

SMALL BREACH AT RT END OF CONC SPILLWAY

LT ABUT VERY DETERIORATED

air Water Conditions:

FREE FLOWING TO RTE 107 BRIDGE

COPY

Overall Condition of Dam: POOR

Contact With Owner: _____

Date of Inspection: 7/11/78

Suggested Reinspection Date _____

Class of Dam: Minor

Signature Kenneth Sten

Date 7/11/78

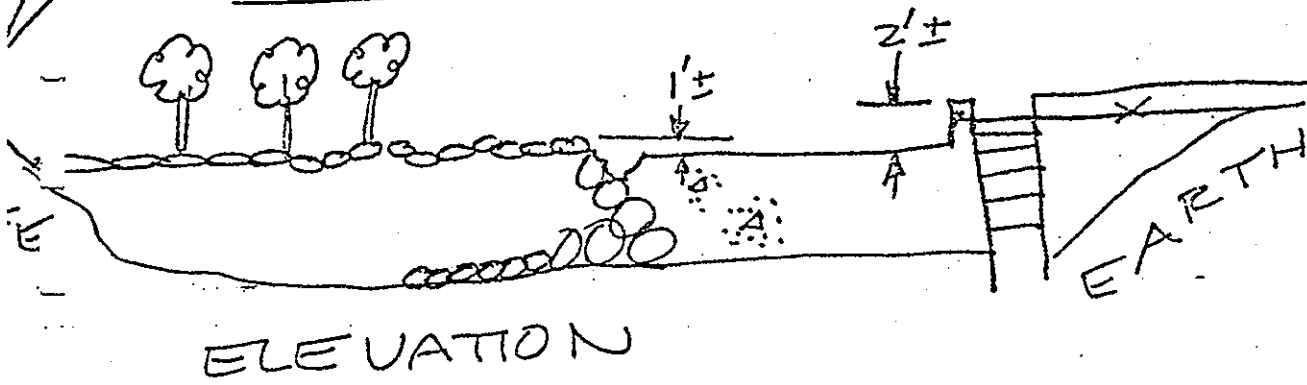
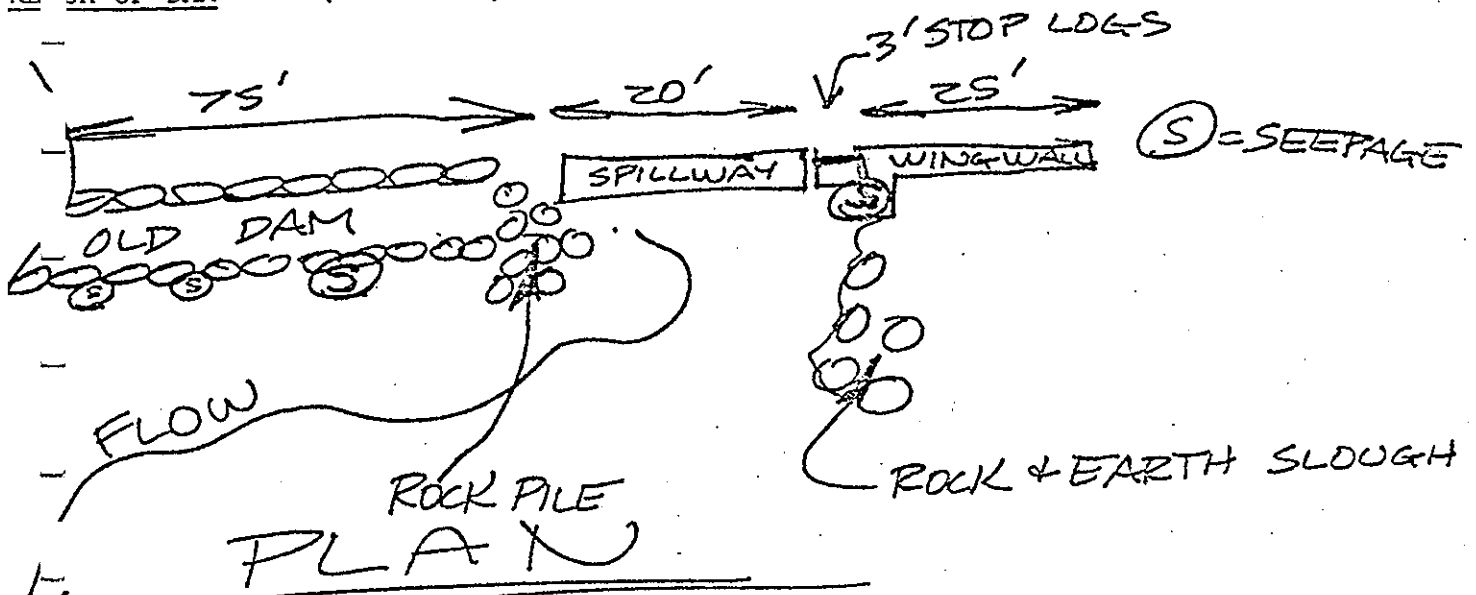
CONTENTS:

- (1) REPAIR LT ABUT @ NEW CONCRETE (2) FILL HOLES
- (3) REPAIR STOP LOG SECTION (4) REMOVE DETERIORATED
CONCRETE STOP LOGS (5) REMOVE STONES EARTH ETC
FROM IN FRONT OF STOP LOG AREA
- (6) REPAIR BREACH @ RT END OF CONCRETE SPILLWAY
- (7) REMOVE TREES FROM OLD DAM
- (8) REPLACE MISSING FILL ON OLD DAM
- (9) REPAIR MAJOR SEEPAGE LOCATION ON OLD DAM

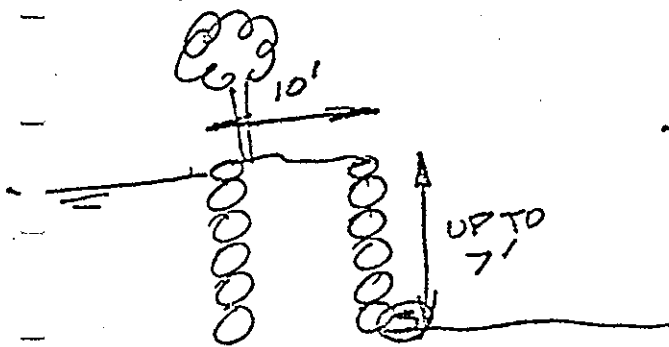
COPY

DESIGN OF DAM

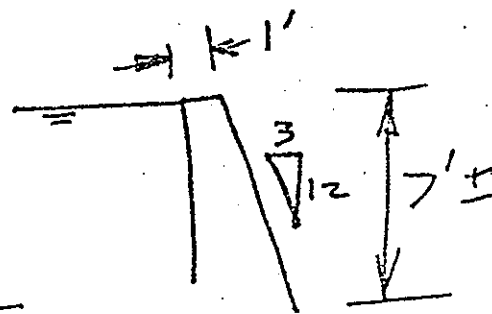
(Show Plan, Elevation & Cross Sections)



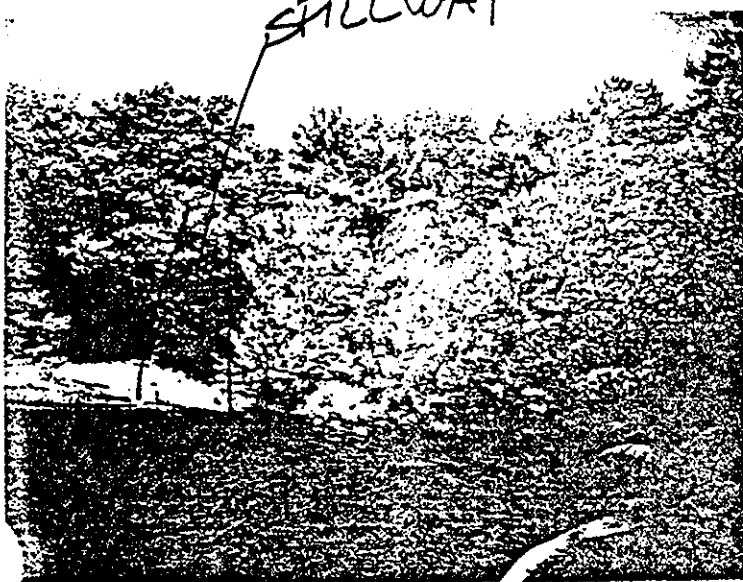
COPY



SECTION THROUGH OLD DAM



SECTION THROUGH NEW SPILLWAY



FREESES POND DEERFIELD

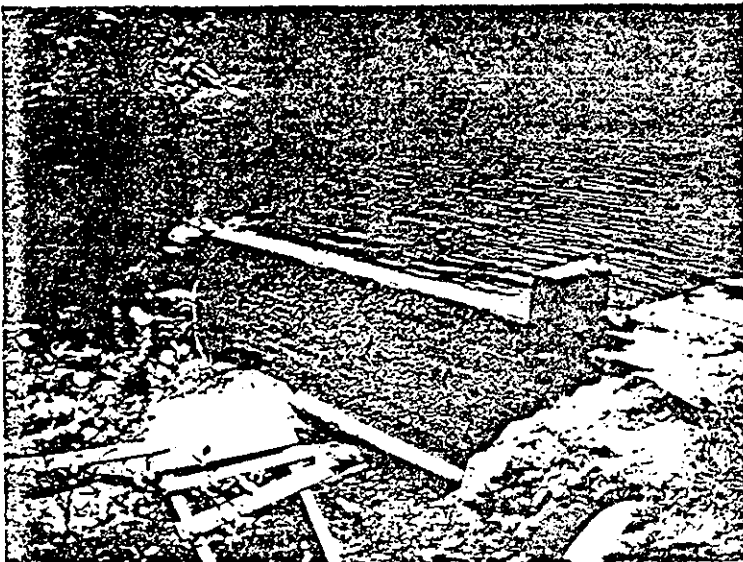
VIEW OF ~~SPILLWAY~~ DAM
FROM UPSTREAM RT
SIDE NOTE: TREE GROWTH



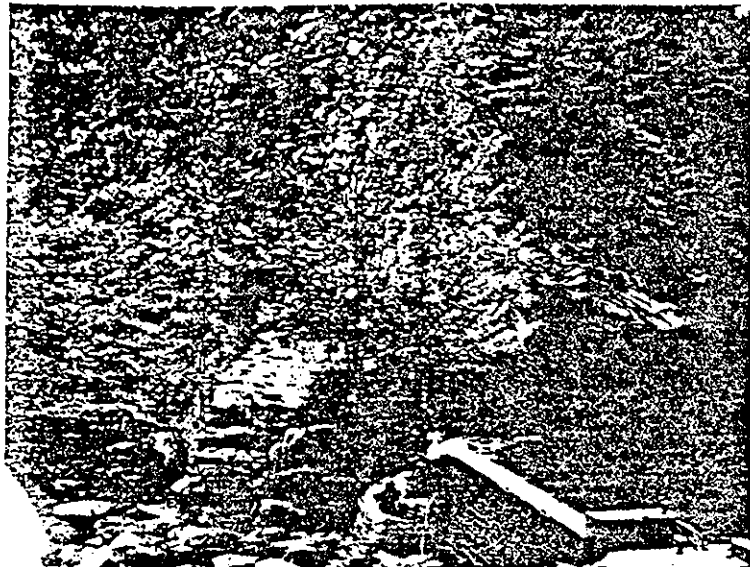
VIEW OF DETERIORATED
LT. ABUT

NOTE: UNDERMINING
& SEEPAGE IN 2
LOCATIONS

COPY



VIEW OF CONCRETE
SPILLWAY FROM
DOWNSTREAM LT
BANK



FREESES POND
DEERFIELD

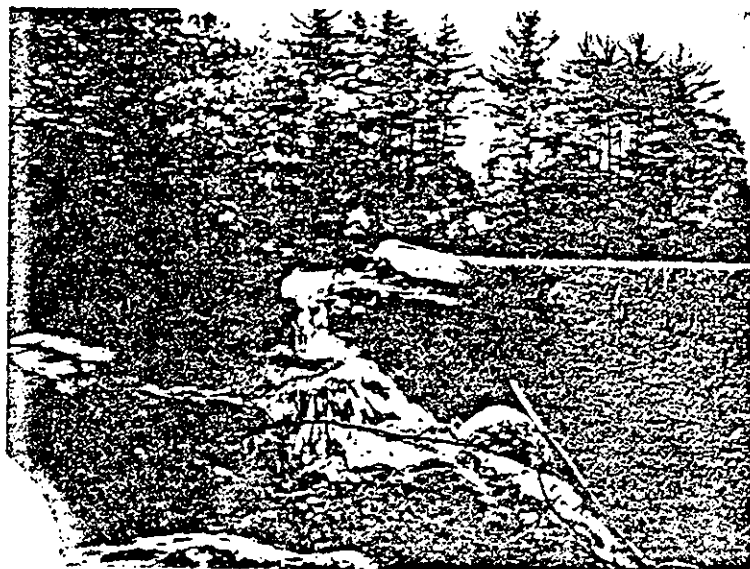
VIEW OF DAM FROM
LT EMBANKMENT

NOTE: BREACH + TREE GRO



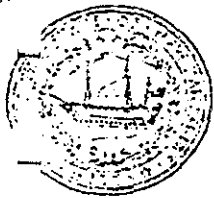
VIEW OF BREACH FROM
SPILLWAY

COPY



VIEW OF BREACH
FROM DOWNSTREAM

KS



State of New Hampshire

WATER RESOURCES BOARD

37 Pleasant Street
Concord, N.H. 03301

TELEPHONE 271-3405

July 12, 1978

COPY

Retex, Inc.
Route 16
Somersworth, New Hampshire 03878

Attention: Mr. Ray Drake, President

Dear Mr. Drake:

Under the provisions of RSA Chapter 482, Sections 8 through 15, copy enclosed, on July 11, 1978, an engineer of the Water Resources Board inspected your dam in Deerfield. This Dam, No. 61.02, is classified in the files of this Office as a menace structure and as such must be maintained in a manner not to endanger public safety nor become a dam in disrepair.

As a result of this inspection several items were in need of maintenance as follows:

- 1- Some stones have been displaced at the right end of the concrete spillway.
- 2- The left abutment is completely deteriorated and has seepage in two locations.
- 3- The stop log section is inoperable due to siltation. I question how easily the concrete stop logs can be removed.
- 4- The old stone dam has minor leakage in two locations and major leakage in one location.
- 5- Many trees are growing on the dam.
- 6- Embankment is missing in some areas between stone walls.
- 7- These are the major areas of concern. Since this dam is a menace structure I recommend that the breach and the left abutments be repaired immediately and the other work be performed soon. See inspection report for more detail.

Because this dam is classified as a menace structure and is rated by our inspector as being in poor condition we request that you notify us of your intent to make the immediate repairs within ten days receipt of this letter.

B-2.12

Freezes Pond Dam

July 12, 1978

Retex, Inc.
Attention: Mr. Ray Drake, President

Chapter 482:42 provides that "The owner of a dam shall so maintain and repair it that it shall not become a dam in disrepair. The procedure and remedies prescribed in this subdivision are supplemental to those prescribed in Chapter 355, RSA, and shall not be limited by that chapter."

This structure at the present time is in partial failure and under the right circumstances could fail causing possible loss of life and property damage. As the owner of this structure we recommend that you take appropriate action as soon as possible.

If notice is not received within the prescribed time above, the Board will proceed according to RSA 482:9 (copy attached).

If you have any questions, please contact us as soon as possible.

Sincerely,

GMM:VAK:paf
Enc.

George M. McGee, Sr.,
Chairman

COPY

Date: November 20, 1978

To: Vernon A. Knowlton,
Chief Engineer

From: Gary L. Kerr, *GLK*
Water Resources Engineer

Subject: Dam Inspection with Army Corps Consultants
Date of Inspection: November 17, 1978

I visited the site of Freeses Pond Dam (No. 61.02) with E. C. Jordan Engineers and met John Trafton of Retex, Inc. Since Ken had recently inspected this dam I only looked for recent changes. The most noticable being that all trees and bushes had been removed from the dam embankment. Approximately two feet of concrete stop logs have been removed but someone put in other logs and debris to stop the discharge. Pond level is 0.1' below the crest. The Retex Representative cleared all debris after inspection was complete.

After inspecting the dam the consultants looked and sized a couple of downstream bridges, namely Route 107 and a town bridge which is currently under construction. The bridge contractor temporarily placed logs back in the stop log section at the dam to reduce flow until more pumps and sandbags were placed in use at their job site.

GLK:paf
Enc.

COPY

APPENDIX C

PHOTOGRAPHS

The following are photographs referenced in this report. See Plan in Appendix B-1 for photograph locations and orientations.



1
VIEW TO WEST ALONG DAM



2
CONCRETE SPILLWAY AND STOP LOG STRUCTURE:
NOTE EROSION OF FAR ABUTMENT.



3
CONCRETE WINGWALL AT EAST EMBANKMENT.
SEEPAGE THROUGH WALL WAS
NOTED AT WATERLINE.



4

VIEW DOWNSTREAM FROM TOP OF DAM



5

BRIDGE LOCATED IMMEDIATELY
DOWNSTREAM FROM DAM



6
VIEW UPSTREAM FROM TOP OF DAM

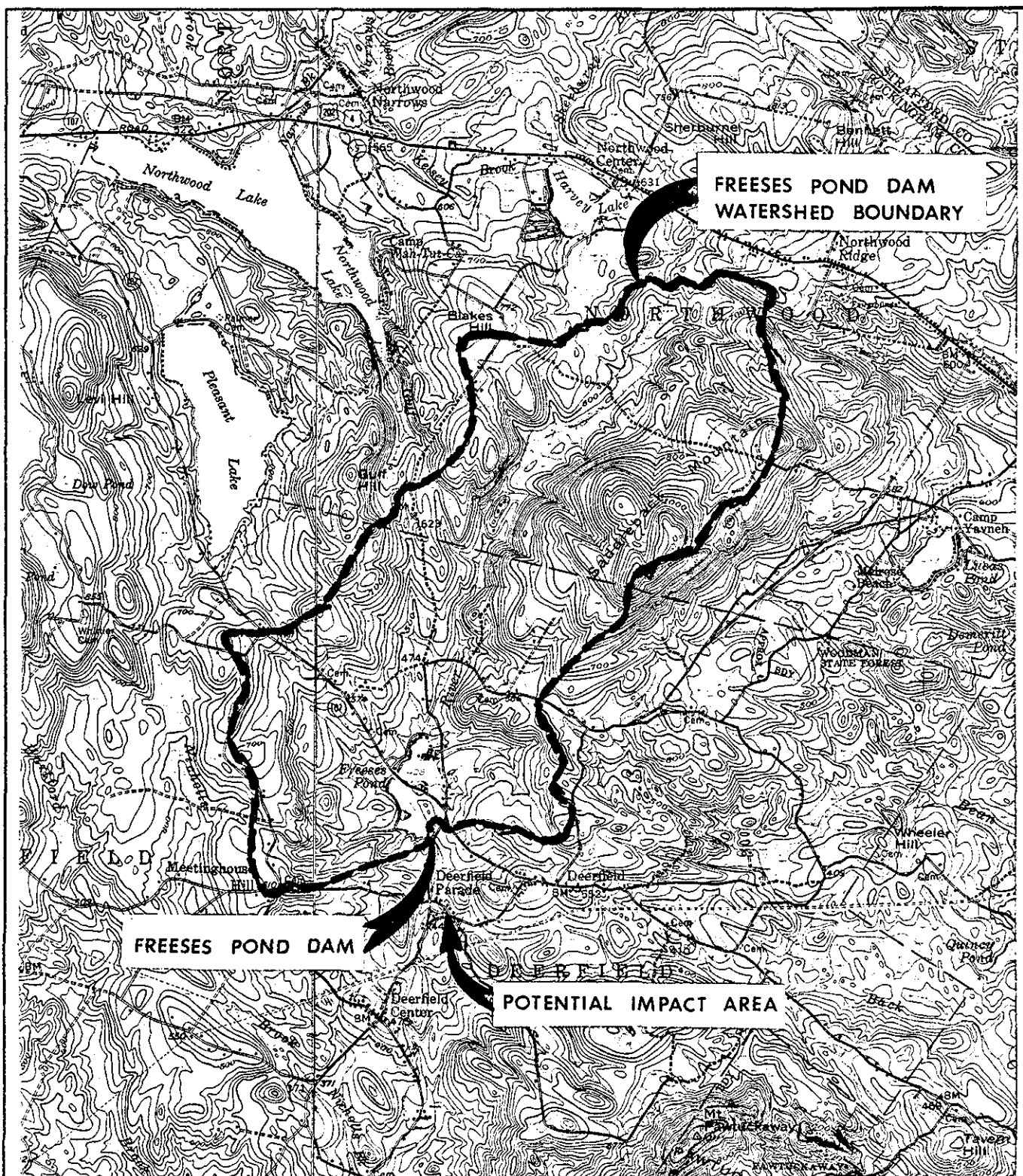


7
CULVERT THROUGH CAUSEWAY
LOCATED UPSTREAM FROM DAM

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Hydrologic computations pertinent to this investigation are attached. The following figure shows the Lamprey River Watershed at the Freeses Pond Dam.



FREESSES POND DAM

POTENTIAL IMPACT AREA

U.S. GEOLOGICAL SURVEY MAP

MT. PAWTUCKAWAY, NH QUADRANGLE
SUNCOOK, NH QUADRANGLE



EDWARD C. JORDAN CO., INC. PORTLAND, MAINE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS MILWAUKEE, WIS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	
FREESSES POND DAM	
LOCATION & DRAINAGE AREA MAP	
2079909	SCALE AS SHOWN DATE MAR. 1979

PROJECT FREESSES POND DAM HYDRAULICS	COMP BY	JOB NO.
	JJD	20799-09
	CHK BY BTB	DATE 2-1-79

DISCHARGE CAPACITY

A. SPILLWAY - FREE OVERFALL WITH VERTICAL UPSTREAM FACE AND NEAR-VERTICAL DOWNSTREAM FACE - ASSUME A BROAD-CRESTED WEIR WITH BREADTH EQUAL TO 1 FOOT
 "C" VALUES FROM KING & BRATER, "HANDBOOK OF HYDRAULICS", 6th Ed.

	SURVEY DATUM ELEV (FT)	USGS ELEV (FT)	H	C	L (FT)	Q (cfs)
CREST	96.0	428.0	0		17.5	
	97.0	429.0	1.0	2.98	"	52
	97.2	429.2	1.2	3.08	"	71
	98.0	430.0	2.0	3.30	"	163
	98.2	430.2	2.2	3.30	"	188
	99.0	431.0	3.0	3.32	"	302
	100.0	432.0	4.0	"	"	465
	102.0	434.0	6.0	"	"	854
	104.0	436.0	8.0	"	"	1,315
	106.0	438.0	10.0	"	"	1,837
	108.0	440.0	12.0	"	"	2,415

B. CONTROL OUTLET - ASSUME BROAD-CRESTED WEIR ($C \approx 2.6$)

	SURVEY DATUM ELEV (FT)	USGS ELEV (FT)	H	C	L	STOPLOGS REMOVED Q	STOPLOGS IN PLACE (ELEV 96) (428 MSL)
TOPOF PIERS	92.0	424.0	0	2.6	3.0	0	0
	93.0		1.0	"	"	7.8	0
	94.0		2.0	"	"	22	0
	95.0		3.0	"	"	41	0
	96.0	428.0	4.0	"	"	62	0
	97.0		5.0	"	"	87	7.8
	97.2		5.2	"	"	93	10
	98.0	430.0	6.0	"	"	115	22
	98.2		6.2	"	"	120	25
	99.0	431.0	7.0	"	"	144	41
	100.0	432.0	8.0	"	"	177	62
	102.0	434.0	10.0	"	"	247	115
	108.0	440.0	16.0	"	"	499	324

PROJECT FREESES POND DAM HYDRAULICS	CCMP BY	JOB NO.
	JJD	20799-09
	CHK BY RTD	DATE 2-1-79

SOUTH
C. EMBANKMENT OVERFLOW - BROAD-CRESTED WEIR ($C \approx 2.6$)

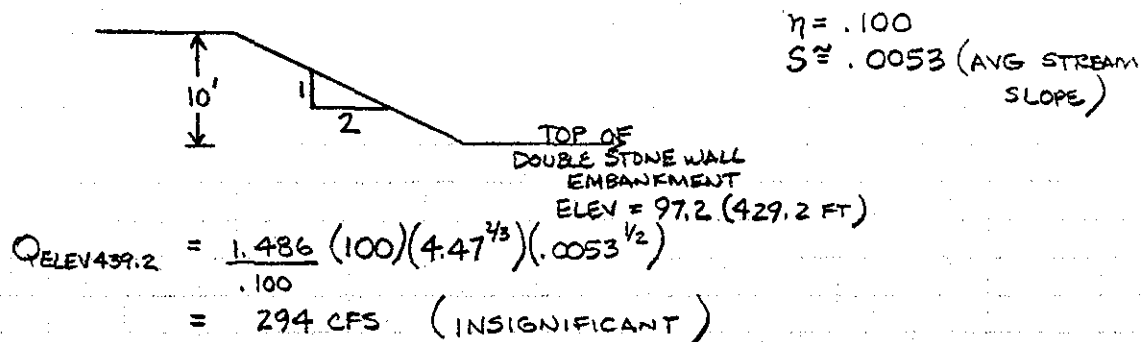
	SURVEY DATUM ELEV (FT)	USGS ELEV (FT)	H	C	L	Q
TOP	97.2	429.2	0			
	98.0	430.0	0.8	2.6	84	156
	98.2	430.2	1.0	"	"	218
	99.0	431.0	1.8	"	"	527
	100.0	432.0	2.8	"	"	1,023
	102.0	434.0	4.8	"	"	2,297
	104.0	436.0	6.8	"	"	3,873
	106.0	438.0	8.8	"	"	5,701
	108.0	440.0	10.8	"	"	7,751

D. CONCRETE WINGWALL & EARTHFILL OVERFLOW - CREST VARIES
FROM 98.2 TO 100.0 FT. - ASSUME WEIR FLOW OVER
24 FEET OF THE SECTION - $C \approx 2.5$ -

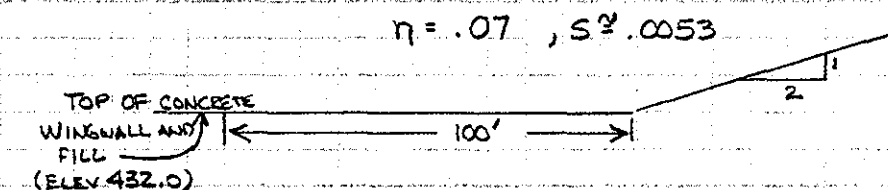
	SURVEY DATUM ELEV (FT)	USGS ELEV (FT)	H	C	L	Q	1/AVERAGE HEAD
	98.2	430.2	0	2.5	0	0	
	99.0	431.0	0.4	"	12	7.6	
	100.0	432.0	1.4	"	24	99	
	102.0	434.0	3.4	"	"	376	
	104.0	436.0	5.4	"	"	753	
	106.0	438.0	7.4	"	"	1,208	
	108.0	440.0	9.4	"	"	1,729	

PROJECT FREESES POND DAM HYDRAULICS	COMP BY	JOB NO.
	JJD	20799-09
	CHK BY BTB	DATE 2-1-79

E. OVERBANK FLOW - SOUTH END OF DAM (DRAWN FROM FIELD INSPECTION NOTES AND PHOTOS)



NORTH END OF DAM (DRAWN FROM FIELD NOTES AND INSPECTION PHOTOS)



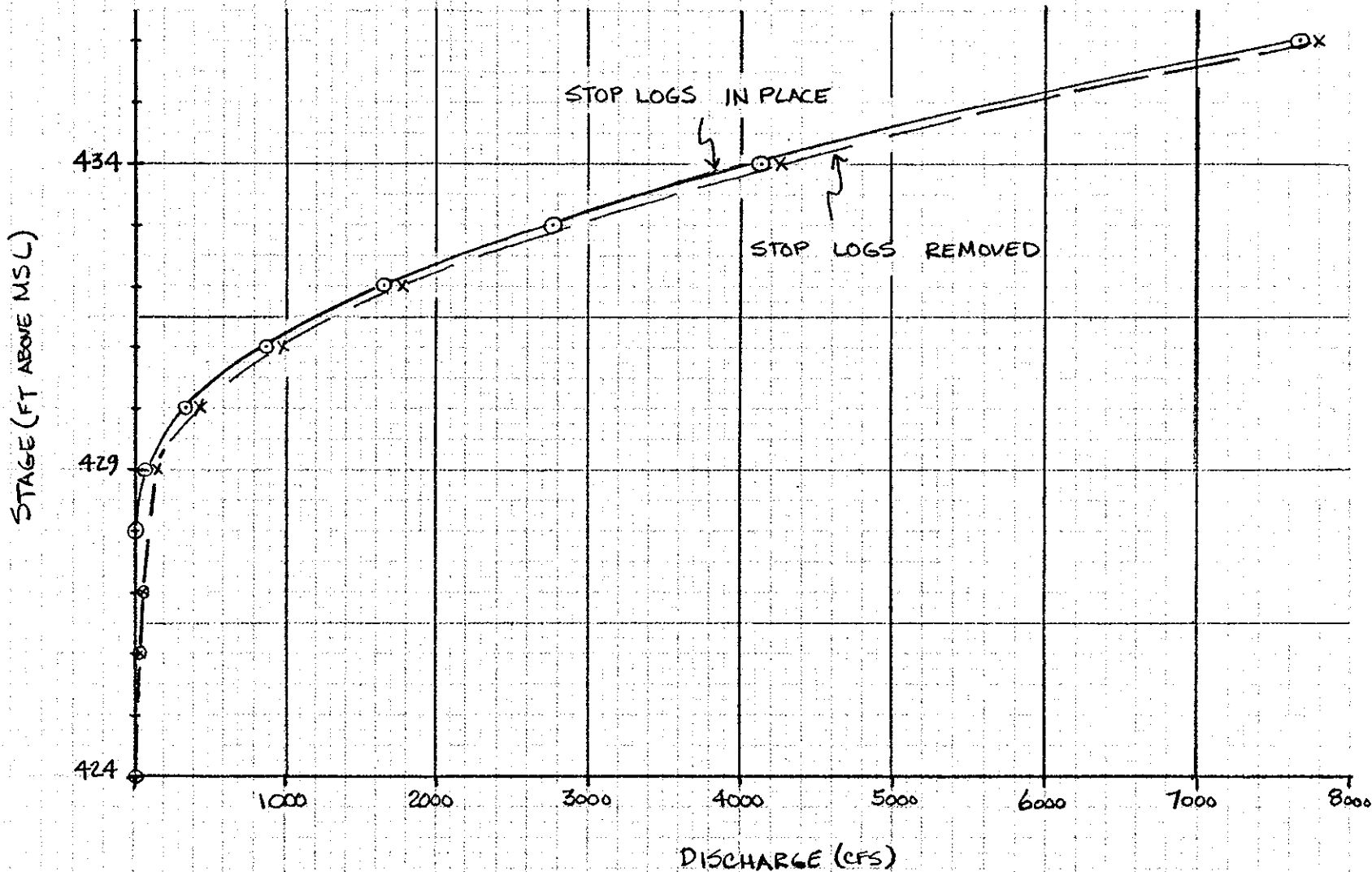
ELEV	$\frac{1.486}{\eta}$	A	P	R	S	Q
434	21.2	204	104	1.96	.0053	493
436	"	416	109	3.82	"	1568
438	"	632	113	5.59	"	3069
440	"	864	118	7.32	"	5020

PROJECT
FREESSES Pond Dam
HYDRAULICS

COMP. BY
JTD
CHK. BY

JOB NO.
20799-09
DATE
3-21-79

RATING CURVE AT DAM



PROJECT FREESES POND AREA - CAPACITY DATA	COMP BY JJD	JOB NO. 20799-09
	CHK BY BTB	DATE 2-1-79

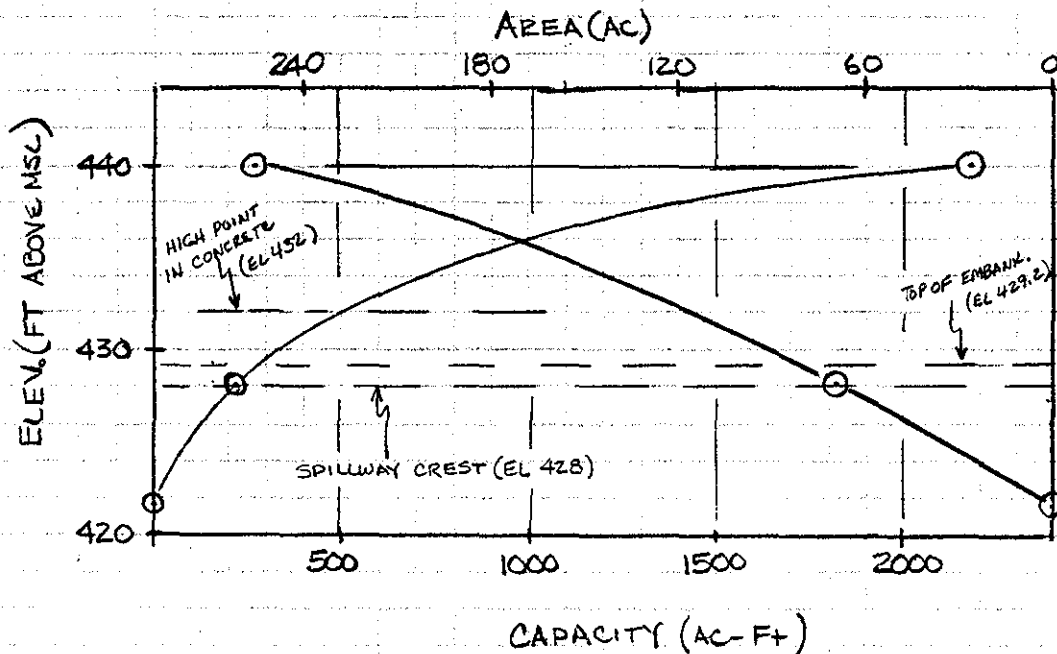
FREESES POND DAM WAS CONSTRUCTED TO INCREASE THE CAPACITY OF AN EXISTING POND. THE AREA - CAPACITY DATA GIVEN BELOW REFERS TO THE ADDED CAPACITY ONLY. THERE IS NO DATA AVAILABLE ON THE ORIGINAL SIZE OF THE NATURAL POND. ALL INDICATIONS SUGGEST THAT IT WAS VERY SMALL (~10 ACRES)

AREA - CAPACITY DATA :

TIE INTO USGS ELEV (APPROX) - SURVEY DATUM ELEV 96 FT
(~ SPILLWAY CREST) = USGS ELEV 428 FT ABOVE MSL

HEIGHT OF DAM FROM SPILLWAY CREST TO DOWNSTREAM STREAM-BED = 6.2 FT

ELEV (FT ABOVE MSL)	(AC.) AREA	(AC.) AVG. AREA	DEPTH (FT)	ΔVOL (AC.-FT.)	VOL (AC.-FT.)
421.8	0				
		35	6.2	217	
428.0	70				217
		163	12.0	1,956	
440.0	256				2,173



PROJECT FREESES POND DAM TEST FLOOD ANALYSIS	COMP BY JJD	JOB NO. 20799-09
	CHK BY BTB	DATE 2-2-79

TEST FLOOD ANALYSIS

DRAINAGE AREA - 8.2 SQUARE MILES (PLANIMETERED FROM USGS MAPS)

HAZARD CLASS - SIGNIFICANT , SIZE CLASS. - SMALL

DESCRIPTION - ROLLING

TEST FLOOD - $\frac{1}{2}$ PMF

FROM CORPS OF ENGINEERS GUIDE CURVES :

PMF PEAK FLOW RATE = 1,700 CFS / SQ. MI.

$\frac{1}{2}$ PMF PEAK FLOW RATE = 850 CFS / SQ. MI.

$\therefore \frac{1}{2}$ PMF = $850 \times 8.2 = 6,970$ CFS

USGS ELEV (FT)	DISCHARGE AT DAM (cfs)	SURCHARGE STORAGE (AC-FT.)
428.0	0	0
429.0	60	48
430.0	341	113
431.0	878	193
432.0	1,649	283
433.0	2,777	383
434.0	4,136	493
436.0	7,685	633

STORAGE = 217 A-F AT SPILLWAY CREST

1 CONTROLLED OUTLET WOULD MOST LIKELY BE CLOSED (TOP OF STOP LOGS AT ELEV 428.0) BECAUSE OF DIFFICULTY OF REMOVAL OF STOP LOGS AT HIGH FLOWS. IN ADDITION, THERE IS NO FORMAL PLAN OR OPERATOR ASSIGNED FOR REMOVAL OF STOP LOGS DURING HIGH FLOWS.

PROJECT FREESES POND DAM TEST FLOOD ANALYSIS	COMP BY JJD	JOB NO. 20799-09
	CHK BY BTB	DATE 2-2-79

1/2 PMF INFLOW - 6,970 CFS

SURCHARGE HEIGHT TO PASS 1/2 PMF = 435.6 - 428.0 = 7.6'

VOLUME OF SURCHARGE :

$$605 \text{ A-F} \times \frac{1}{8.2 \text{ MI}^2} \times \frac{12}{640} = 1.38 \text{ INCHES}$$

$$Q_{p2} = 6970 \left(1 - \frac{1.38}{9.5} \right) = 5,958 \text{ CFS}$$

SURCHARGE HEIGHT TO PASS Q_{p2} = 435.0 - 428.0 = 7.0 FT
VOLUME OF SURCHARGE :

$$\left(\frac{565}{8.2} \right) \left(\frac{12}{640} \right) = 1.29 \text{ IN.}$$

$$\text{STOR1} + \text{STOR2} = 1.34 \text{ INCHES}$$

$$Q_{p3} = 6970 \left(1 - \frac{1.34}{9.5} \right) = 5,990 \text{ CFS}$$

1/2 PMF OUTFLOW AT DAM = 5,990 CFS \approx 6,000 CFS

@ ELEV 435.1 FT MSL

SPILLWAY CAPACITY AT TOP OF DAM (ELEV 429.2) = 71 CFS
OR 1% OF 1/2 PMF

HOWEVER, OVERTOPPING OF THE DAM WILL RESULT IN A VERY HIGH TAILWATER CONDITION. OVERTOPPING BY 2 FEET MAY CAUSE THE COMPLETE SUBMERGENCE OF THE DAM DUE TO BACKWATER CONDITIONS CAUSED BY THE BRIDGE JUST DOWNSTREAM OF THE DAM. THE 1/2 PMF WILL OVERTOP THE DAM BUT FAILURE OF THE DAM AT THAT POINT WOULD NOT SIGNIFICANTLY INCREASE THE FLOW OR DOWNSTREAM HAZARD.

PROJECT FREESES POND DAM DAM FAILURE ANALYSIS	COMP BY JJD	JOB NO. 20799-09
	CHK BY BTB	DATE 2-2-79

DAM FAILURE ANALYSIS

ASSUME WATER SURFACE ELEVATION FT TOP OF DOUBLE STONE WALL PORTION OF DAM - ELEV 429.2 FT

THE DAM IS MOST LIKELY TO FAIL IN THE DOUBLE STONE WALL WITH EARTH FILL SECTION. EVIDENCE OF A PREVIOUS BREACH AT THE JUNCTION OF THIS SECTION OF THE DAM AND THE CONCRETE SPILLWAY WAS OBSERVED AT THE FIELD INSPECTION. IT WAS ESTIMATED THAT $\frac{1}{3}$ OF THIS EMBANKMENT SECTION WOULD FAIL.

(1) STORAGE AT TIME OF FAILURE = 270 AC-FT

(2) PEAK FAILURE OUTFLOW, Q_{pf}

$$Q_{pf} = \frac{8}{27} W_b \sqrt{G} Y_o^{3/2} \quad W_b = (.33 \times 84) = 27.7 \text{ FT}$$

$$= 938 \text{ CFS} \quad Y_o = 429.2 - 421.8 = 7.4 \text{ FT}$$

(3) FLOW JUST PRIOR TO FAILURE

(A) SPILLWAY $Q = 71 \text{ CFS}$

(B) CONTROLLED OUTLET - AT TIME OF INSPECTION, CONCRETE STOPLOGS AND DEBRIS VIRTUALLY BLOCKED FLOW FROM THIS OUTLET, ASSUME $Q=0$

(4) ^{TOTAL} FLOW FROM FAILURE = $938 + 71 \approx 1,000 \text{ CFS}$

(5) TIME FOR RESERVOIR TO EMPTY, T

$$T = \frac{12.1 S}{\frac{1}{2} Q_p} = \frac{12.1 (270)}{\frac{1}{2} (1,000)} = 6.5 \text{ HOURS}$$

PROJECT

FREESSES POND

DAM FAILURE ANALYSIS

COMP BY

JJD

CHK BY

BTB

JOB NO.

20799-09

DATE

2-2-79

CROSS - SECTION #2 (900 FT BELOW DAM)

$$S = 270 \text{ A-F}$$

$$q_1 = 1,000 \text{ CFS} \quad \text{TRIAL STAGE} = 3.4 \text{ FT}$$

$$V_1 = (616)(900)/43,560 = 12.7 \text{ A-F}$$

$$q_2 = 1000 \left(1 - \frac{12.7}{270}\right) = 953 \text{ CFS}$$

$$V_2 = (587)(900)/43,560 = 12.1 \text{ A-F}$$

$$V_{AVE} = 12.4 \text{ A-F}$$

$$Q_2 = 1000 \left(1 - \frac{12.4}{270}\right) = 954 \text{ CFS}$$

$$\text{STAGE} = 3.3 \text{ FT}$$

CROSS - SECTION #3 (3000 FT BELOW DAM)

$$S = 270 \text{ A-F}$$

$$q_1 = 954 \text{ CFS} \quad \text{TRIAL STAGE} = 5.3 \text{ FT}$$

$$V_1 = \left(\frac{299 + 587}{2}\right) \frac{(2100)}{(43,560)} = 21.3 \text{ A-F}$$

$$q_2 = 954 \left(1 - \frac{21.3}{270}\right) = 879 \text{ CFS}$$

$$V_2 = \left(\frac{280 + 553}{2}\right) \frac{(2100)}{(43,560)} = 20.1 \text{ A-F}$$

$$V_{AVE} = 20.7 \text{ A-F}$$

$$Q_3 = 954 \left(1 - \frac{20.7}{270}\right) = 881 \text{ CFS}$$

$$\text{STAGE} = 5.1 \text{ FT}$$

A FEW (2 TO 5) HABITABLE STRUCTURES COULD BE DAMAGED. FLOOD DEPTHS OF 1 TO 2 FEET POSSIBLE AT THESE HOUSES. HAZARD CLASSIFICATION - SIGNIFICANT

PROJECT

FREESSES POND DAM
DAM FAILURE ANALYSIS

COMP BY

JJD

JOB NO.

20799-09

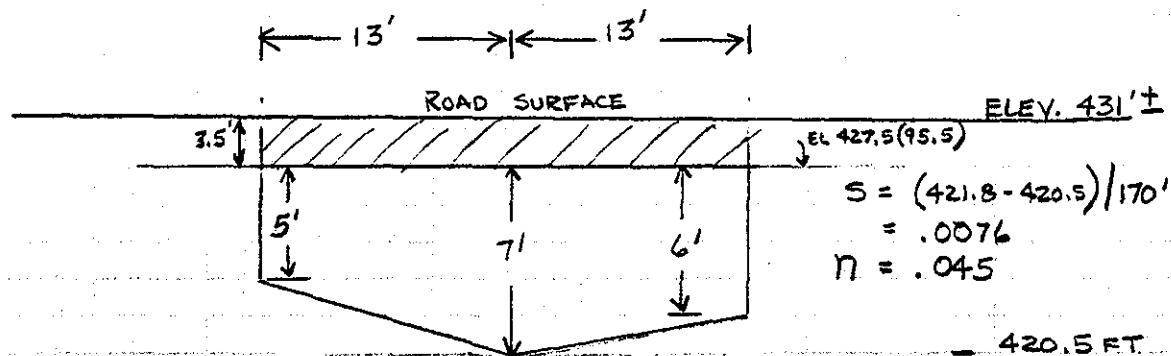
CHK BY

BTB

DATE

2-2-79

X-SECT #1
CROSS-SECTION AT
BRIDGE 170 FEET DOWNSTREAM OF DAM



CAPACITY UNDER BRIDGE WITH FREE SURFACE

$$A = 149.5 \text{ FT}^2, P = 37.2, R = 4.02, Q = 1,090$$

FLOW FROM FAILURE = 1,000 CFS, \therefore WATER SURFACE ELEV. AT
BRIDGE WOULD BE ~ 427.4 (SPILLWAY CREST = 428.0 FT)

AT DISCHARGES ANY GREATER THAN $\sim 1,000$ CFS, COMPLETE SUBMERGENCE
OF THE DAM WILL OCCUR.

FOR DAM FAILURE ANALYSIS, PEAK DISCHARGE CAN PASS UNDER
THE BRIDGE.

TO CHECK CAPACITY UNDER BRIDGE ASSUMING ORIFICE FLOW :

ELEV : 428.5 FT

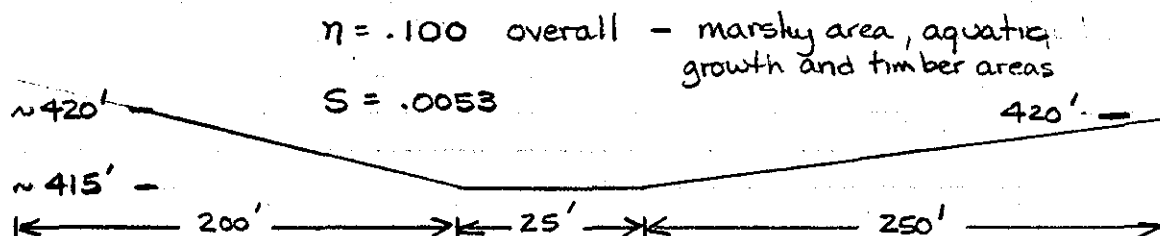
$$Q = CA \sqrt{2gH} = .7(149.5) \sqrt{2g(1)} = 840 \text{ CFS}$$

ELEV : 431.0 FT

$$Q = CA \sqrt{2gH} = .7(149.5) \sqrt{2g(3.5)} = 1,571 \text{ CFS}$$

PROJECT FREESES POND DAM DAM FAILURE ANALYSIS	COMP BY JJD	JOB NO. 20799-09
	CHK BY BTB	DATE 2-2-79

CROSS-SECTION #2
(LOCATED APPROX. 900 FEET BELOW DAM)



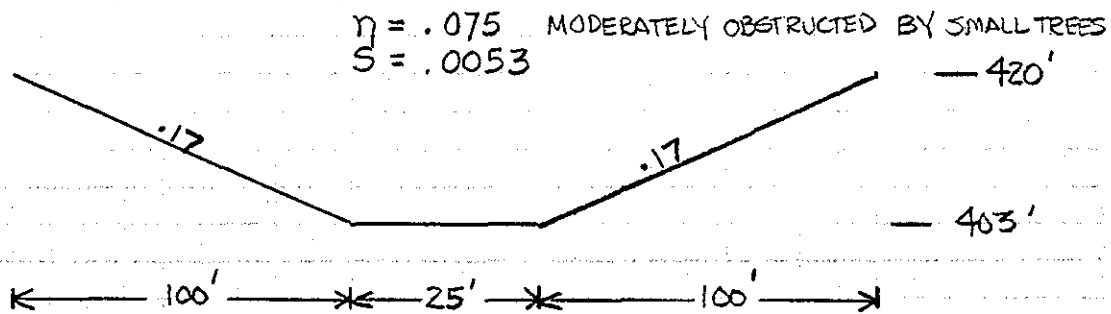
MSL ELEV	$\frac{1.486}{\eta}$	A	P	R	S	Q
417	14.9	230	205	1.12	.0053	269
418	14.9	480	295	1.63	.0053	718
419	14.9	820	385	2.13	.0053	1465

PROJECT
FREESES POND DAM
DAM FAILURE ANALYSIS

COMP BY
JJD
CHK BY
BTB

JOB NO.
20799-09
DATE
2-2-79

CROSS-SECTION #3
(LOCATED ABOUT 3,000 FT BELOW DAM - AT
TOWN OF DEERFIELD PARADE)



MSL ELEV	$\frac{1.486}{\eta}$	A	P	R	S	Q
405	19.8	74	49	1.51	.0053	140
406	19.8	128	61	2.10	.0053	301
407	19.8	194	73	2.66	.0053	533
408	19.8	272	85	3.20	.0053	845
409	19.8	362	97	3.73	.0053	1,244

APPENDIX E
Information as Contained in National
Inventory of Dams



INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE
NH	472	NED	NH	015	01				FREESES POND DAM	4309.1	7114.0	01JUN79

POPULAR NAME	NAME OF IMPOUNDMENT
	FREESES POND

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	04	LAMPREY RIVER	DEERFIELD	1	1780

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCT. HEIGHT (FT.)	HYDRAU. HEIGHT (FT.)	IMPOUNDING CAPACITIES	
					MAXIMUM (ACRE-FT.)	NORMAL (ACRE-FT.)
PGOT	1917	R	7	6	270	217

DIST OWN FED R PRV/FED SCS A VER/DATE
NED N N N N 01JUN79

REMARKS
1-NHHRB-61.02 21-STONE WALL EMBANKMENT + CONCRETE 22-PRIOR 20-PROJ'D 1980

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
D/S HAS	SPILLWAY			MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY		NAVIGATION LOCKS										
	CREST LENGTH	TYPE	WIDTH (FT.)			INSTALLED (MW)	PROPOSED (MW)	NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)		
2	140	U	18	70														

OWNER	ENGINEERING BY	CONSTRUCTION BY
RETEX, INC		

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NH WATER RES BD	NH WATER RES BD	NH WATER RES BD	NH WATER RES BD

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
EDWARD C JORDAN CO, INC	17NOV78	PUBLIC LAW 92-367 8AUG1972

REMARKS